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ELECTRICAL REVIEW

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Engineers as Salesmen

Importance of the Technical Background

JUDGING by recent correspondence in the official organ of the Electrical Power Engineers' Association some members of that body are not in favour of treating salesmanship seriously while others see danger in encouraging it.

One of the writers, indeed, expresses the opinion that "the increase in units generated is due almost entirely to efficient power station running and certainly not to the selling of cookers or sweepers." This conjures up a picture of supply undertakings living by taking in one another's units and thus ensuring a very high load factor, which is an important element in efficient power station running.

This is an example either of wilful blindness to facts or intellectual snobbery, akin, as we pointed out in an earlier study of the subject, to the loathing of trade which obsessed the early Victorian aristocracy. But just as these people discovered that there was money in commerce and decided that *pecunia non olet*, so enlightened power supply engineers have discovered that technical excellence is not enough, but must be backed by commercial ability, either in one and the same person or separately.

The *Electrical Power Engineer* says that in an ideal Society there might be no need for sales engineers, but under the existing economic system an efficient and technically qualified sales personnel is a vital necessity to the industry and it cites the McGowan Report in support of this view.

Acceptance of Diplomas

The objections seem to be based largely on the proposal of the Association to organise sales engineers for whose admission into the Association (to quote the *Electrical Power Engineer*) "a certain standard of technical knowledge and experience has been laid down, that standard being a fairly exacting one." To this end the Association has organised a course leading to a diploma in electrical engineering salesmanship and economics. A critic of this scheme says that he entirely agrees with the principle, but considers that it is unimportant until proof is forthcoming of its acceptance as a qualification in the industry.

This is a somewhat obstructionist attitude. The truth is that until the members of the E.P.E.A. realise the altered situation in the supply industry and themselves take the course and diploma seriously (and, we may perhaps add, the similar arrangements instituted by E.D.A.) they cannot expect their employers to attach much weight to the scheme.

This altered situation, as we have insisted on many previous occasions, is the narrowing of the purely technical side of supply work and the broadening of the selling side. The effect of this must be either a transfer of the present engineers from the power station to the distribution and sales departments or an influx of specially-trained men, perhaps not highly qualified as engineers, but able to build up the undertaking's load.

Strengthening the Association

There is little doubt which is to be preferred from all points of view. The engineer with knowledge of the technical problems of the industry and, moreover, with practical experience in the application of electricity in the power station itself and in his own home is the right man for the sales job—provided he adds to his technical experience an appreciation of the consumer's point of view and the way to meet it.

With the existence of a large body of members having the requisite training in salesmanship superimposed upon their engineering background the E.P.E.A. would be in a strong position to secure proper grading for sales engineers. Moreover, the members of the Association would have little cause to apprehend the "dilution" which seems to be the fear of some of them. One correspondent, for instance, visualises the "older members" being "swamped by sales engineers, consumers' engineers, industrial engineers and distribution engineers."

The Association hopes by its salesmanship course to eliminate so-called "sales engineers," who lack the essential training and are a hindrance to electrical development, by organising qualified sales engineers and raising their status. It claims that this will benefit the industry and on this account should receive the unqualified support of members.

And, we must add, if that isn't sufficient reason, self-preservation demands it.

No Station at Barlaston

As a result of objections by property owners, residents and other interested parties, the proposal of the North-West Midlands Joint Electricity Authority to build a selected station at Barlaston has had to be turned down by the Electricity Commissioners. No doubt, Mr. F. Favel, chief engineer and manager to the J.E.A., will be able to find another site after looking round, but the new station is required to meet the load of the Potteries and of the grid in 1943, and such delays do not help to make cheap electricity available to the million. A point in favour of the Barlaston site was that the effluent from the Strongford sewage works of Stoke-on-Trent could have been used to provide make-up water for the cooling towers. Some of the arguments against the scheme remind one of those directed a century or so ago against the establishment of railways in some localities, the inhabitants of which ultimately lost heavily by winning their case at the time.

Rural Electricity

THE economics of rural electrification is dealt with in an easily assimilated manner in a booklet produced under the auspices of the E.D.A. Rural and Agricultural Electrification Committee. It commences with a brief statement of the case for the introduction of electricity into the countryside, and shows that electricity has become available to 67 per cent. of the population of rural areas. In 1934 the proportion was only 33 per cent. In the same period the length of electric mains in rural areas has increased by 440 per cent. to over 20,000 miles. The nature of the problem is emphasised by the statement that 20 per cent. of the population of the country occupies 89 per cent. of the total area. Considerations arising out of this are surveyed to explain why rural distribution is an expensive matter. Means of overcoming the difficulties are suggested, and the booklet then goes on to show how greatly the agricultural community benefits from a supply of electricity—on the farm and in the farmhouse. We are told that the booklet is not intended for general distribution, but it is to be hoped that it will have a wide circulation among those able to influence opinion in our rural areas.

IN THIS ISSUE

	Page
Articles :	
Distribution in a Steelworks	113
Locating Cable Faults	117
Reconditioning Domestic Appliances	119
Powerful Swiss Locomotive	120
Multiple-earthed Neutrals	123
News :	
Successful Small Rural Undertaking	118
Argentine Trade	121
Electricity in Eire	125
War Risk Insurance	126
Scandinavian Markets	129
Fatal Shock from Earthing Device	131

"Ekco" Lamps

THE announcement that E. K. Cole, Ltd., are commencing the manufacture of electric lamps marks another important step in this concern's march into the domestic field. The company was, of course, known originally as a leading radio manufacturer, but it took up from time to time the production of connectors, washing machines, instruments and plastic mouldings. A number of other radio manufacturers have travelled in the same direction, largely on account of the vicissitudes through which the radio industry has passed during the last few years. We can mention, for example, H.M.V., Pye, Beethoven, Cossor, Vidor and Graham Farish.

New Zealand Trade

ELECTRICAL manufacturers, in common with other United Kingdom producers, have felt the effects of the import restrictions imposed by the New Zealand Government some months ago. They may therefore derive some comfort from the assurances given by Mr. Nash, the Dominion's Finance Minister, in recent discussions with representatives of the Home Government. He stated that it was his Government's intention to relax the restrictions in the interest of trade between the United Kingdom and New Zealand wherever possible. While certain native industries were enjoying a form of protection from the licensing system the system would not be used to foster uneconomic industries or to prevent reasonable competition. It is to be hoped that Mr. Nash's assurances will be followed by some improvement in the position. The £9,000,000 credit for the Dominion which is being arranged should have some influence in this respect.

What is a "Non-Stat"?

A NEW electrical term has come to our notice—"non-stat." This is not, as might be inferred, a device for preventing radio interference but an abbreviation of "non-statutory electricity undertaking," interference with which it is the aim of a new body to prevent. The first annual general meeting of the Association of Non-Statutory Electricity Suppliers & Distributors was held recently when the aims of the organisation were stated. Chief among these is the securing of fair treatment in any legislation which may arise out of the McGowan Report, including compensation for goodwill, loss of future profits, capital invested and loss of employment. A report of the meeting which has been sent to us by the chairman, Mr. J. E. Green, 11, Dence Park, Herne Bay, sets out at length the Association's case in opposition to the McGowan Committee's recommendations with regard to "non-stats."

E.A.W. Handbook

WE are not surprised that it has been found necessary to publish a third edition of the "Electrical Handbook for Women," produced by the Electrical Association for Women, for it provides in a reasonable compass pretty well all that an electrical demonstrator needs to know about the technique and application of electricity, electrical law and tariffs, and allied matters. It even tells the student how to explain the difference between lighting and heating charges, which is not so easy as it sounds, and it deals also with the even more vexed question of fixed charges. A chapter has now been added on first-aid for electric shock victims. We cannot appreciate the use of a variable radio condenser as a symbol on the dust cover, but this does not prevent the book from being an excellent five-shillings' worth.

A Halske Centenary

IT is a reminder that the electrical industry is getting on in years when it is realised that the 125th anniversary of the birth of Johann Georg Halske occurs on Sunday. It was Halske who, in 1846, joined with Werner Siemens to found the Siemens and Halske concern which still flourishes. The business commenced with the manufacture of the telegraph which Siemens had invented and the organisation of the works on efficient lines was due to Halske's ability. He parted on good terms with his partner in 1867, when he thought that Siemens was taking business risks too great for the firm to manage. He died in 1890.

A British Lead

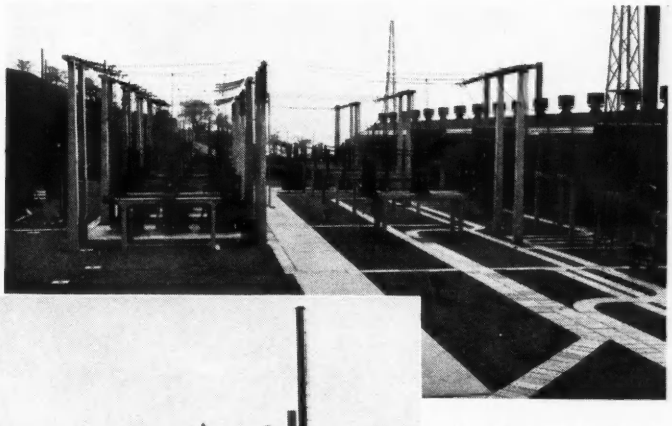
ACCORDING to *Time* (New York) an eminent British visitor to Connecticut was much struck by the method adopted by the State Highway Department of illuminating the kerbs of a main road. He asked for full particulars in order to enable him to get the idea taken up in England. Whereupon he was informed that the scheme was a copy of one installed in England. Not all good ideas originate abroad and the moral is the same as that suggested by some touring agencies: "See Britain First!"

STEELWORKS DISTRIBUTION

Extensive System at the New Ebbw Vale Steelworks includes both Private Generation and Public Supply

A FEW weeks ago we described the new hot and cold rolling mills for the continuous production of wide sheet steel at the new Ebbw Vale steelworks of Richard Thomas & Co., Ltd., as an outstanding electrical development in this country. While that installation is of primary importance, there are other features of the new Ebbw Vale venture which are of particular electrical interest, and in this article we attempt to show how some 30,000/40,000 kW is supplied throughout a works designed for an output of 600,000 tons of steel per annum.

The geographical features of the site, which is about 1½ miles long by ¼ mile wide, and its intersection by a considerable system of railways and roads played a special part in the layout of the electrical distribution. Coupled with this was the necessity to maintain a daily load of some 12,000 kW already being distributed to existing systems from the Victoria power station, which had remained running for the seven years since the old Ebbw Vale steelworks was shut down. The chief electrical load centres are the hot and cold mills already described, the iron and steel plant and the existing colliery system. Minor loads are the Ebbw Vale town supply, the existing sheet mill, and supplies to outlying existing quarries and brickworks, some of them outside the works area.



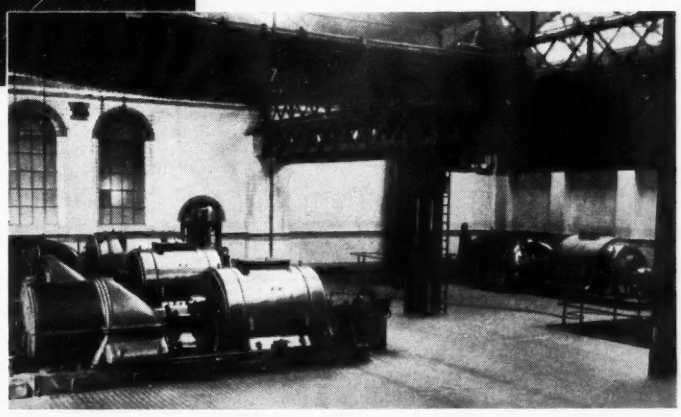
Grid sub-station from roof of main 11-kV sub-station ; trench covers indicate orderly layout of cables and pipes

Blast-furnace sub-station showing blast furnaces and gas-washing towers on right

The sources of supply chosen to meet this load are a direct grid connection working in conjunction with the existing Victoria power station. The grid supply is given by two 132-kV lines from the C.E.B. sub-station at the Upper Boat power station of the South Wales Electric Power Co. This is stepped down at Ebbw Vale by three 30,000-kVA transformers. The C.E.B. sub-station is designed on the ground type mesh principle, employing concrete structures for supporting the 132-kV conductors, and providing accommodation for a third incoming line.

The 132-kV switchgear and transformers were supplied by Metropolitan-Vickers. In addition to the 132-kV equipment, there are the usual auxiliary plant houses containing relay panels, l.v. switchgear, and oil conditioning equipment. The fire barrier walls and curbs around the transformers are noteworthy, and the orderly layout of trenches for cables and oil pipes gives a very pleasing appearance to the sub-station as a whole.

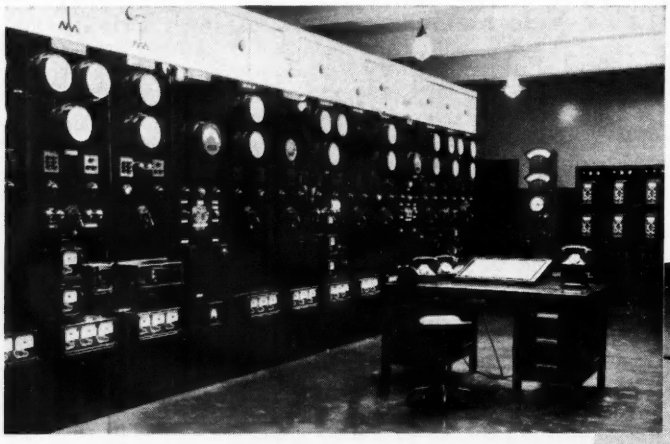
The Victoria power station contains two Oerlikon and one Parsons 5,000-kW turbo-alternators, one 12,000-kW set with an Escher-Wyss turbine and an A.C.E.C. alternator, two 5,00-kW Westinghouse rotary convertors and two 750-kW La Cour motor convertors. The largest set has been increased in capacity from 10,000 kW by reconstruction, including the addition of a new h.p. steam end. The 5,000-kW sets generate at 2.2 kV and the 12,000-kW set at 6.6 kV. One 5,000-kW set and the 12,000-kW set are tied to transformers connecting them to the 20-kV busbars, while the other two sets are connected to the 2.2-kV busbars direct. There are two interconnector transformers of 4,000 kVA each, with an 8 per cent. reactance, which link the two sets of busbars.



Turbine room of Victoria power station ; 12,000-kW reconditioned set on right

The original power station had 2.2-kV busbars only, the switchgear being of the B.T.H. cubicle design. The complete switchboard has been rebuilt and reconditioned with B.T.H. equipment with a rupturing capacity of 150 MVA, and the whole of this reconstruction was carried out with the generating station on

normal daily load. The reconstruction included new cell doors and complete modern interlocking, while a particularly interesting feature of the reconstruction scheme was the wiring of the control panels. The new



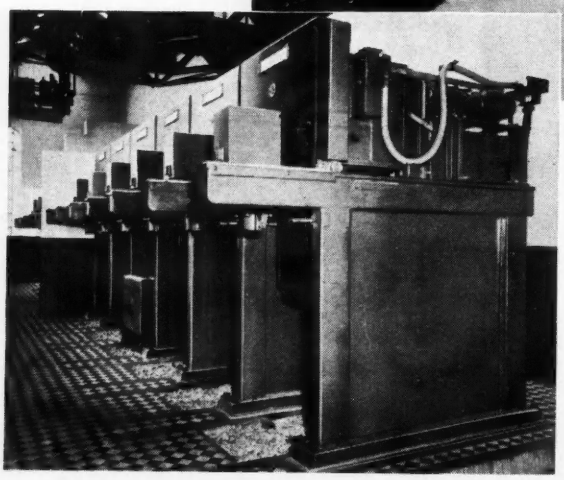
Control room in main 11-kV sub-station

wiring was built up on the frames away from the panels, the old wiring being removed as the new units were connected.

The 20-kV switchboard, of B.T.H. manufacture, with desk control panels, replaces a former board originally installed in a sub-station which does not now exist. This sub-station was an early interesting development for supplying the collieries and original works system at 20-kV. The original switchboard referred to has been re-used as described later.

The new 20-kV switchgear is now

2.2-kV switch room in steelworks sub-station, showing (left) operating gear for 20-kV switches and swing-back panels



20-kV switchgear at Victoria sub-station

accommodated in a well-designed building adjacent to the turbine room. The switchgear has single busbars, divided by a section switch and barrier wall. There are oil sumps under the switches for quick clearance of oil in the event of fire, and all the important high-voltage cables are run in enclosed ducts and passages and are protected from fire by the modern form of asbestos tubing where they enter the switchgear.

The step-up transformers for the alternators and the interconnecter transformers are installed in cubicles with roll-up doors forming part of the 20-kV switch house. The switch rooms for both 20-kV and 2.2-kV, and the transformer cubicles are protected by CO_2 fire-fighting equipment. The turbines were originally supplied with steam from a range of boilers operating at 160 lb./sq. in., with an aggregate useful output of about 280,000 lb. of steam per hour. The three 5,000-kW sets are still operated from these boilers, which are also now interconnected by reducing valves to a new modern boiler house operating at 350 lb./sq. in. and 675 deg. F. superheat. The 12,000-kW reconstructed set is supplied direct from the new boilers.

The new boiler house contains three 100,000 lb./hour Simon-Carves boilers, which, in conjunction with the low-pressure boiler plant and various waste-heat

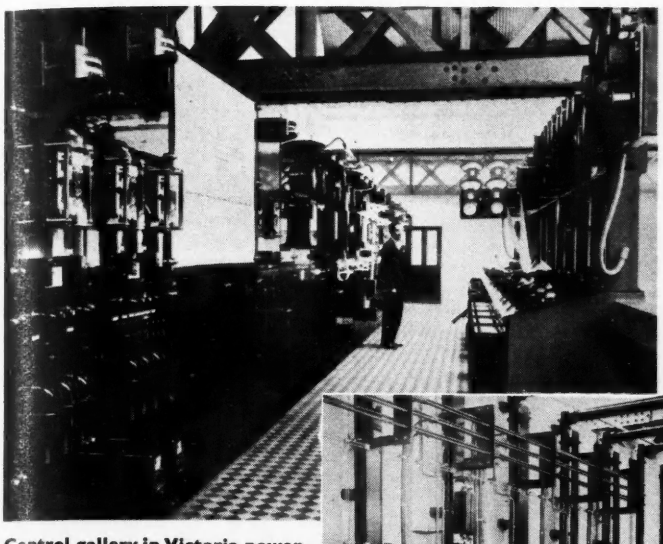
20-kV switchgear at blast-furnace sub-station

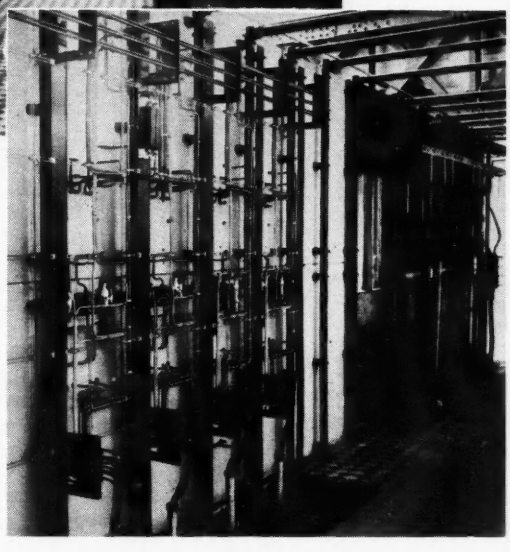
boilers, handle the steam requirements of the power station, blast furnace and Bessemer blowers, mills and coke ovens. The boilers are fired by blast-furnace or coke-oven gas, but are also arranged for firing by pulverised fuel alone or in combination with either gas. An interesting feature of the new boilers is the Askania automatic control equipment, which deals primarily with gas firing, the pulverised-fuel firing being in the nature of a base-load service. The auxiliaries of two boilers are electrically driven and those of the third boiler are steam driven. Of these the electrically driven induced- and forced-draught fans are operated on the Metrovick Ward-Leonard system, part of this DC power being

Switchgear in main 11-kV sub-station, showing section barriers

supplied by boosters and part from the power house busbars, a scheme which has the advantage of standby in case of failure of either.

The Ward-Leonard fan sets and the 90-HP pulveriser motors are all supplied at 2,200 V, the coal feeder and magnetic separators being connected to the low-voltage system. Each boiler is fitted with Simon-Carves pulverisers, Howden preheaters and fans and Green economisers.





Control gallery in Victoria power station; 2.2-kV board on left with mosaic mimic diagram and 20-kV board on right

The pea coal used for pulverising is of 14,000 BThU. calorific value, and is stored in an overhead bunker of 800 tons capacity. There is a magnetic separator in the feed to each pulveriser, and the coal feeders are driven by variable-speed commutator motors controlled by induction regulators. Complete water treatment and coal-handling plants also formed part of the Simon-Carves contract. The cooling of the circulating water for the power station condenser plant is dealt with by two Mitchell concrete cooling towers each having a capacity of one million gallons per hour.

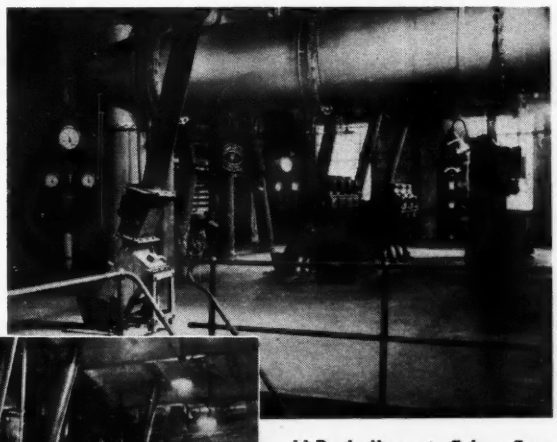
Primary distribution throughout the works can be roughly divided into the 11-kV system at the point of grid supply, and the 20-kV system supplied from Victoria power station. These two systems are interconnected by transformer feeders, which deal with flow of power from one to the other, according to the balance of purchased and generated electricity. The main works 11-kV sub-station is situated alongside the grid sub-station, and is equipped with a B.T.H. 12-panel 11-kV switchboard with circuit-breakers of 750 MVA rupturing capacity. The busbars are arranged in three sections, each fed by one of the 30,000-kVA grid transformers.

To the two outer sections are connected symmetrically the duplicate feeders to the hot and cold mills respectively, and the two interconnectors to the power station. There are barrier walls between the switchgear sections and oil ducts under the switches leading to three separate outdoor oil sumps. A cable tunnel runs under the floor at the back of the switches and is divided into three independent sections. All cables entering these tunnels are protected from fire by asbestos tubes and all cables leave by means of separate pipes. On the same floor as the switchroom are the main blocks of reactors protecting the feeders to the mills. The reactors are of the B.T.H. air-cooled concrete type housed in separate cells with interlocked steel doors and all cables connecting them to the switchboard are run in separate sets of ducts. In the centre of the switch house, between the reactor cells, are the battery and auxiliary plant rooms. Above this block is the control room with the 11-kV and C.E.B. 132-kV control boards and the C.E.B. metering equipment. All control cables are run independently of power cables and enter a sub-basement under the control room. Such cables enter and leave the sub-basement in vertical tunnels with steel access doors and are thus isolated from fire damage.

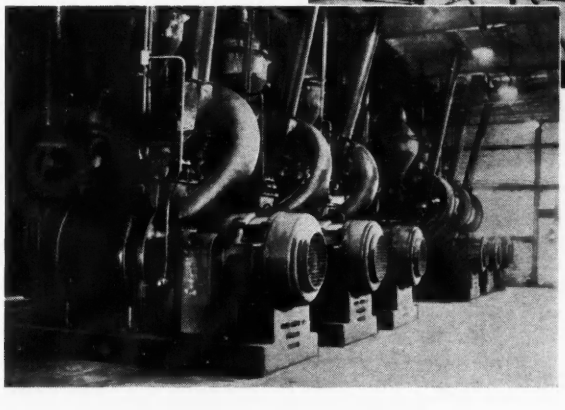
The two Hackbridge inter-

Wiring of reconditioned 2.2-kV control board at Victoria power station

connector transformers are of 20,000-kVA capacity, each stepping up to 20 kV from 11 kV with ± 10 per cent. on-load tap changing equipment. They are mounted on concrete rafts surrounded by chippings in an enclosure outside the sub-station building and their bushings are connected to the cable circuits by means of open connections to sealing ends on concrete structures. The contract for the cable work was executed by Siemens Bros. The enclosure also houses liquid earthing resistances and switches for earthing the neutral of the 20-kV side of the transformers. A "Mulsifyre" fire-fight-



H.P. boiler at firing floor showing coal feeders, magnetic separators, pulveriser motor starters and boiler control board



Two banks of pulverising mills (three per boiler) at new boiler house

ing installation protects this outdoor equipment. The 11-kV feeders to the mills are in duplicate and the reactors mentioned reduce the fault capacity at the mill sub-stations to within 500 MVA. These feeders were laid by Edison Swan and are designed for ultimate capacities of 36,000 kVA and 15,000 kVA for the hot and cold mills respectively. The hot mill 11-kVA switchboard comprises 18 500-MVA switches feeding the motor generator sets and motors for driving the mills, low-voltage distribution transformers and starting reactors. The cold mill switchboard comprises eleven similar switch units.

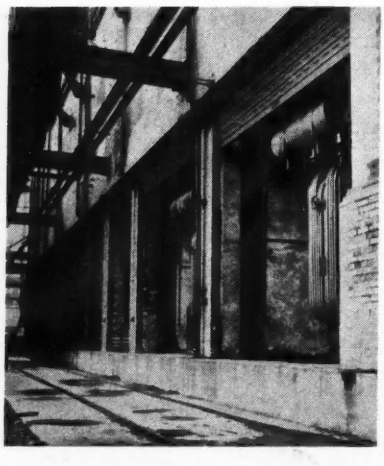
Turning now to the 20-kV system, there is a works ring main supplied through reactors from the main 20-kV switchboard at Victoria and feeding three 20-kV sub-stations. This ring is designed for an ultimate capacity of about 12,000 kVA with a fault capacity of 250 MVA. Connected also to the 20-kV switchboard are two colliery feeders to a system comprising ten 20-kV sub-stations connected by about 17 miles of overhead lines and cable. The switchgear on this system is protected by means of two reactors at Victoria which reduce the fault capacity to within 150 MVA.

Use of Existing Equipment

The choice of 20 kV for the works was made largely on account of the extensive colliery system at this voltage and in order to make use of valuable switchgear and transformers at this voltage which were already available. The 20-kV works ring-main comprises Siemens split-conductor cables and the reactors are protected overall by circulating current protection

The three works ring sub-stations are designated blast furnace, steelworks and Drill Ground, the last supplying Ebbw Vale U.D.C. and a transmission line to various brickworks and quarries. The blast furnace sub-station is arranged in two storeys with 20-kV switchgear upstairs and 2.2-kV and 440-kV switchgear at ground level. The 20-kV 250-MVA spring-operated Reyrolle switchgear is in five units, comprising two ring feeder switches and three transformer switches controlling respectively one 1,430-kVA and two banks of two 1,430-kVA MV reconditioned transformers connected in parallel.

The 2.2-kV 75-MVA Reyrolle switchgear has two section switches and three sections of busbars fed respectively by the transformer banks described above. In the middle section are duplicate feeders to the blast furnace hoists. To the outer sections are connected 2.2-kV duplicate feeders to the blast furnace tuyere pump house, coke oven plant and to the local Prince of Wales colliery. The pairs of feeders are disposed one on each section. The 750-kVA 440-V transformers are disposed one in each of the outer sections and supply the blast furnace gas conditioning and cleaning plants as well as compressors, lighting and other auxiliaries.



Victoria power station transformers; interconnector transformers on right

The steelworks sub-station contains 20-kV and 2.2-kV switch rooms on one level with transformers in outdoor bays. The switchgear is of the same design as that in the blast furnace sub-station, but the arrangement of spring-operation of the 20-kV circuit-breakers is of interest. The operating mechanism is extended through the wall of the 20-kV switchroom to handles in the 2.2-kV switchroom. Swing control panels surmount their respective switch-operating handles and form an inexpensive and safe method of providing remote control.

The steelworks sub-station feeds only at 2.2-kV to the Bessemer and open hearth plant, to pumping stations for the mills, the soaking pits sub-station, and to the existing sheet mills. The Hackbridge transformers stepping down from 20/2.2-kV are each of 4,000-kVA capacity and are duplicates of the transformers at the power station connecting the 20-kV and 2.2-kV busbars. There is accommodation for a third future transformer. CO_2 protection is provided for the 20-kV switchgear and "Mulsifyre" for the transformer. The third 20-kV sub-station is situated at the far end of the plant in Ebbw Vale Town. This is equipped with two ring switches, a transformer switch and feeder switch controlling the 20-kV system to brickworks and quarries.

The switchgear is accommodated in the Ebbw Vale U.D.C. sub-station containing one 1,000-kW, one 500-kW and one 150-kW rotary convertors for town supply, which are fed from a 2.2-kV board connected to the step-down transformer. Supplies at low- voltage are also given from here to the Richard Thomas main offices and to local pumps.

The line to the quarries is six miles long, and it serves at the terminal at Blaen Duffryn a 300-kVA double voltage transformer with 3,300-V and 440-V secondaries. This is controlled by an Allen West outdoor air-break switch with tetrachloride fuses. The 3,300-V and 440-V supplies from the transformer are taken, respectively, via switchgear in the indoor sub-station to an adjacent "pill box," where there is a gate-end mining type unit, from which a 5-core trailing cable gives a supply to an electric navvy working at the quarry face, and ironclad switch-fuse units afford 440-V supplies for drills, etc. Similar tappings on the 20-kV line are made at Trefil, Sirhowy and Gantra sub-stations for supplies to brickworks, etc.

DC Supply

Reverting to the Bessemer and open hearth plant, there are secondary sub-stations for supplying DC power to cranes and chargers, and AC power for Bessemer blower, bottom shop and open hearth auxiliaries. These contain 2.2-kV switchgear fed from the major steelworks sub-station, 440-V distribution supplied from two 1,000-kVA, 2,200/440-V transformers, and DC switchboards. A feeder also runs from the 2.2-kV board for supplies to the basic slag and lime-burning plants.

The DC switchboards are part of a separate DC system supplied from the power station. The main switchboard at Victoria is divided into two sections, each containing one 500-kW rotary and one 750-kW motor convertor, the sections being normally coupled by busbar links. The main DC switchboards were supplied by Crompton Parkinson, Ltd.

There are three main DC sub-stations, one at the blast furnaces for supplying the orebridge and scale cars, and the other two at the steel plant.

All the feeder cables within the works are laid underground, and for internal distribution a very comprehensive system of underground tunnels and ducts has been constructed. Above ground, distribution in buildings is largely carried out in steel conduits laid by Messrs. John Lightfoot, who also contracted for the general wiring and lighting.

The whole scheme of power distribution was drawn up by Messrs. H. A. Brassert & Co., Ltd., consulting engineers for the iron and steel plant, in association with Mr. Manley Roberts, chief electrical engineer for the steelworks and power plant, and Messrs. Kennedy & Donkin, consulting engineers for the Central Electricity Board. We are indebted to Messrs. Richard Thomas & Co., Ltd., for permission to visit the works and to take photographs, and to Mr. Manley Roberts and Mr. P. F. Grove, electrical engineer to Messrs. Brassert, for their help in preparing this article.

LOCATING CABLE FAULTS

Reasons for Failure with the Murray Loop Test

By W. Woodiwiss, A.M.I.E.E.

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THE Murray loop test for localising shorts and earths on cables is represented by fig. 1 and at first glance it appears to be very simple. That experience corrects this false impression is made evident by the reluctance of many distribution engineers to apply this test and their pessimism during the test. They prefer the much simpler method of inspecting the route of the faulty cable. Sometimes they may be fortunate and discover a gang of labourers looking towards the track that they were excavating with alarmed expressions, they may find smoke issuing from a cubicle or feeder pillar, or they may see a dry patch on a wet pavement and feel encouraged. On the other hand there may be no indication and, as a last hope, they must make the "loop test."

Theoretically, there is no reason why this test should not give correct indications, since it is based on the most fundamental of electrical laws—Ohm's. In practice there are difficulties, but if certain precautions are observed and a little preliminary patience exercised there is no reason, in general, why the first opening of ground should not reveal steaming soil and odours of carbonised cables.

A robust and compact Murray loop test set by the Cambridge Instrument Co. capable of an accuracy of 0.1 per cent. on faults up to 20,000 ohms

Check Tests

Confidence in the instruments is one of the first essentials of success. Housing schemes are in progress in most undertakings' areas, and long lengths of distributors are laid and are being serviced. It is on these "dead" systems that the testing set can be conveniently checked. Artificial shorts or earths can be introduced on the service terminals of the service cables, and their location can be checked from each end of the distributor. The familiarity and confidence gained in handling the apparatus are themselves invaluable.

Since these check tests will presumably be carried out on fine days when the instruments will be dry, whereas an actual location test will probably be carried out on a wet day, the difference in the weather should not be allowed to affect the proved accuracy of the instruments when dry; wet instruments are leaky and not reliable.

The apparatus used for the Murray loop test is so simple that it is difficult to imagine it being faulty. If it fails to give results on the check tests the following points should be examined. The push button switches in the battery and galvo. circuits should be examined for good contact; the wiring should be examined for broken or dry soldered joints; the sliding contact should be examined for good contact throughout the range.

The *ratio uniformity* can be easily checked by calibration against a Wheatstone bridge, as illustrated in fig. 2. If the Murray bridge is correct, then for various positions of the slide wire (x), $x/l = b/(a+b)$.

To balance for zero indication on the galvanometer it is essential that the instrument should be very sensitive to small changes of current about zero, and it should be non-frictional. It is advisable, when the point of balance is reached, to tap the galvanometer lightly so as to reduce the frictional effect; it should be carefully levelled.

Errors in Application

It is in the application of the Murray method that errors are very liable to be made. To attempt a loop test on the cores of cables across which are completed other circuits is futile from the outset, as illustrated by the dotted circuits of fig. 1. On extra-high-voltage cables all potential circuits; on low-voltage feeders all voltmeter circuits; on distributors all consumers', street lighting and traffic controller circuits must be cleared.

It might be imagined that in applying the checked bridge to an actual faulty cable cleared of extraneous circuits success similar to that achieved with the artificial faults would be gained; here again disappointment awaits the unwary. The artificial fault is ideal if (1) there is perfect insulation on all conductors up to the point of fault; (2) all conductors are copper continuous throughout their lengths; (3) undamaged in their sections and have their normal "healthy" resistances; (4) the "fault" is well defined and of low resistance. It is due to the fact that an actual fault may deviate from one or more of these conditions that the real difficulties generally arise in practice.

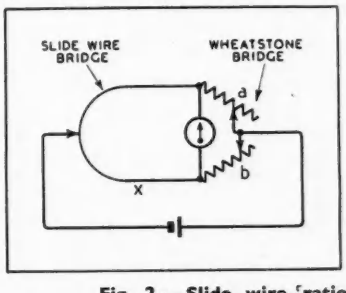


Fig. 2.—Slide wire ratio check. $x/l = b/(a+b)$ l = length of slide wire

In essence, fault localising is the measurement, or comparison, of the very low conductor resistances of the cable; if fault resistances are included in these measurements then the results will be inaccurate. It is for this reason that a

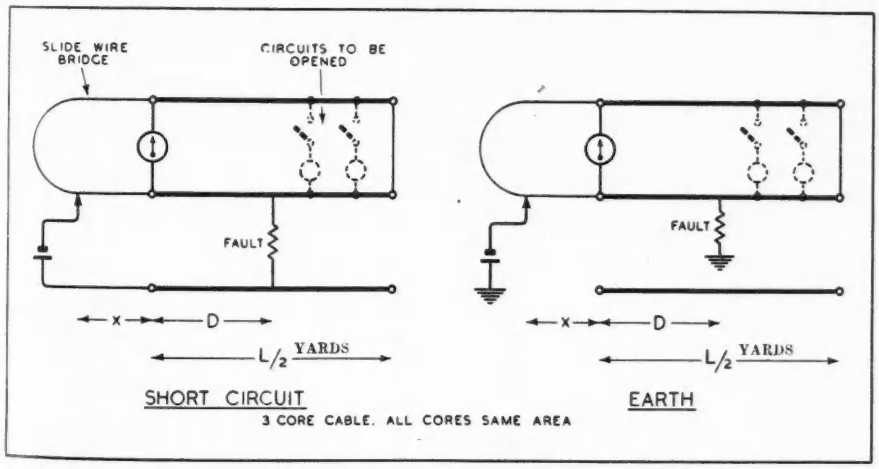


Fig. 1.—Murray loop test. D = distance of fault from testing end = (x × L) yards/length of slide wire

definite procedure for the analysis of the nature of the fault is the indispensable prelude to any fault location test.

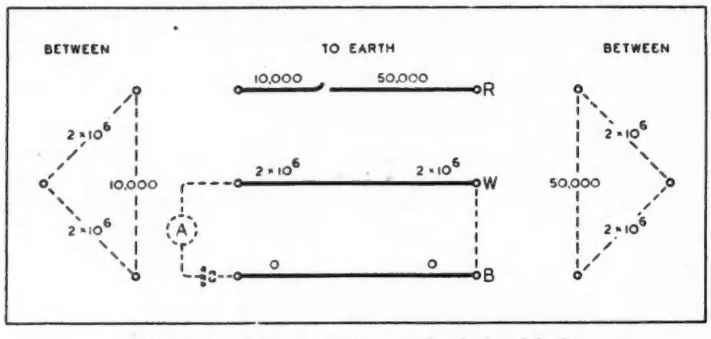


Fig. 3.—Insulation resistance. Analysis of fault

After cleaning and drying the cable terminal insulators an insulation test is made on each core of the cable at each end of the cable with a "dry" Megger; these tests will indicate which cores retain good insulation—if any—and the condition of the faulty cores. The insulation of the latter may have broken down to earth, or between conductors, or both. The results of a test can be graphically recorded as in fig. 3.

Since to perform a loop test two electrically continuous conductors are required, it is advisable to check the conductor resistance roughly. If the measured resistance is substantially correct it will ensure that the cores have not been reduced in section by arcing at the fault, or that a core has not burnt completely through and (by carbonisation) established quasi-continuity; either of these effects can considerably affect the accuracy of a location test.

The dotted connections in fig. 3 show how the continuity

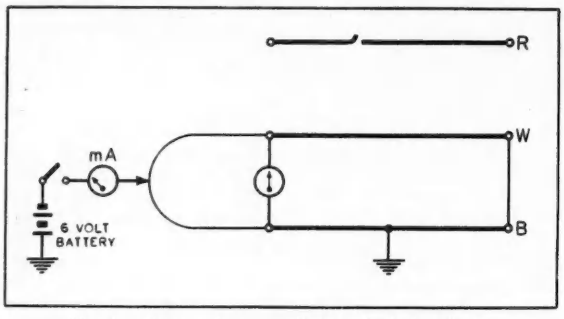


Fig. 4.—Murray loop applied to fault in Fig. 3

test can be quickly made with a 2-V accumulator and an ammeter; for example, a reading of 30 A would give a resistance of 2/30=0.06 ohms—quickly verified from tables.

Fig. 4 shows the faulty cable connected up for making the loop test, and it will, perhaps, be surprising to learn that, in spite of all the precautions exercised up to the moment, when the 6-V battery key is depressed no deflection of the galvanometer is obtained over the whole scale of the slide wire.

This is due to a misinterpretation of the "Megger" readings as fig. 5 will reveal. The reading recorded on the diagram as zero may have any value up to 5,000 ohms; consequently the 6-V battery can only pass 6/5,000=1.2 mA into the bridge. To obtain suitable deflections on the galvanometer some 50 mA will have to be sent into the bridge, which means that the voltage applied to the bridge will have to be 300. To ensure that sufficient current is passing into the bridge it is very useful to include a milliammeter in the bridge circuit as indicated in fig. 4.

The bridge should now give a definite location and, when the test is repeated from the other end, the results should be reasonably consistent. In making the calculations allowances will have to be made for different sections of conductors, and for connecting leads if these are of different section from the cables.

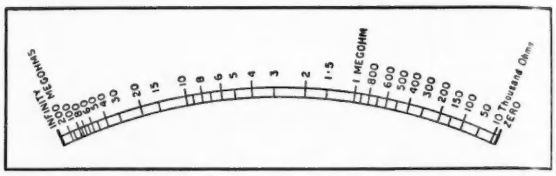


Fig. 5.—Scale of typical general purpose "Megger"

Before opening up ground at the point indicated by the test the mains records should be examined to see if there is a sleeve or joint box near; if so, it should be opened first, or recently been opened.

Résumé of Loop Testing

(1) Check the instrument periodically. (2) Clear all extraneous circuits off the faulty cable. (3) Make an insulation resistance from both ends. (4) Make a conductor continuity test. (5) Keep all instruments and connections dry, cable end insulators dry and clean, and the galvanometer level. (6) Include a milliammeter in the bridge circuit to ascertain that sufficient current is being passed into the bridge to ensure satisfactory operation. (7) In calculations make corrections for conductors if of different section and for any connecting connections. (8) Before opening up at the point indicated by the test examine the mains records for any joints near, or the actual site for signs of recent excavations. (9) Before making any test, survey the route and see if the cause of the fault is not self evident.

Successful Small Rural Undertaking

THE interesting story of the growth of a small rural electricity undertaking is told in a recently published booklet written by Sir Seymour Williams, K.B.E., T.D., and Mr. W. C. Bowler, A.M.I.E.E., electrical engineer to the Warmley R.D.C., to which we referred in our issue of July 14th.

The Warmley rural district is situated between Bath and Bristol and has a population of 9,000, averaging only one per acre. To people who live in urban areas and do not fully realise what electricity means to the country dweller, the pertinacity of the inhabitants in their efforts to obtain a supply may be surprising. As far back as 1903-4 the Council secured a Provisional Order, but could not obtain a bulk supply, and the Order was revoked. Further efforts were made from time to time without success, and in 1926 the Council again decided to apply for an Order in view of the powers that were likely to be given to the Electricity Commissioners to enforce a bulk supply. A neighbouring undertaking made a competing application and an inquiry was ordered. In view of the fact that the undertaking would only offer to regard two streets already supplied with gas as a compulsory area the Order was finally granted to the Warmley Council, which subsequently obtained a bulk supply from the West Gloucestershire Power Co. A scheme was prepared and a contribution was obtained from the Unemployment Grants Committee by way of refund of interest of capital in respect of certain non-compulsory works. Even then, many difficulties were encountered, including opposition from landlords.

The extent of development can be appreciated from the fact that at December 31st last there were 2,081 consumers, while the number of dwellings in the area of supply was 2,410, of which roughly two-thirds had a rateable value of less than £10. There are now some 340 cookers, 170 water heaters and 500 HP of motors connected to the mains. A number of builders in the district are installing electric cookers, wash boilers and bathroom water heaters in every house they build: one demonstration house visited by 8,000 people in a fortnight consisted of a dining room, drawing room, hall, tiled kitchen, tiled bathroom, and three bedrooms, completely equipped electrically with cooker, wash boiler, bathroom water heater, etc., and marketed for £575.

The extent to which the Council has followed its slogan of "Electricity for All" is illustrated by the fact that recently it spent £850 to give a supply to a hamlet of nine houses. Supplies to outlying houses are given from the nearest main road supply route by means of a wooden-pole line across the fields, the consumer being charged a nominal rent of 2s. 6d. per pole per annum except for the first two poles, and no guarantee is asked for. Even so, although when the undertaking was started a shilling rate in aid was needed, it is now self-supporting; last year there was, for the first time, a small surplus. Offices, showrooms and a demonstration room have been established. The engineer and staff are in personal contact with every consumer, and it is this which has been responsible for building up an efficient undertaking.

Last year the Council sold 1,107,800 kWh at an average price of 2.36d. per kWh. The maximum demand was 414.5 kW and the load factor 35.6 per cent.; capital expenditure to date amounts to £58,061. The undertaking has a hire scheme covering cookers, water heaters, wash-boilers and kettles.

DOMESTIC APPLIANCES

Methods of Reconditioning Adopted at Liverpool

THE development of domestic electrification has been particularly rapid in Liverpool during the past five years, and since 1934 the number of appliances out on hire has increased from 11,000 to more than 53,000, including 35,280 cookers (with electric kettles), 6,810 water heaters, 7,470 wash boilers, and 3,780 radiators. To provide an adequate repair and maintenance service for these and a reserve of reconditioned apparatus the Electric Supply Department has organised a comprehensive repair and reconditioning workshop.

The old generating station in Pumpfields, Vauxhall Road, has been equipped to deal with any type of repair work likely to be required, and its 13,500 sq. ft. of floor area has been carefully allocated so as to ensure a steady flow of work from the receiving bay through the various stripping, cleaning, plating, &c., departments and right on to testing, storage and dispatch.

During a recent visit to the workshops, the progress of cookers through the reconditioning process was traced for us. A choice of two standardised types is now offered to consumers, but in addition the maintenance section has to deal with a number of superseded models. Arriving by van, every cooker first has a ticket attached on which is recorded the whole of its history throughout its period in the repair shops. Then, as far as is necessary, the apparatus is stripped down ready for cleaning (it is not considered necessary to strip down every cooker completely). All component parts such as boiling plates, grill-boilers, elements, oven and grill furniture, &c., are dealt with in their own appropriate section. Any part possible is salvaged.

Part of the stores at the Liverpool Corporation Electricity Department's domestic appliance repair and reconditioning workshop

Great importance is attached, from the point of view of minimisation of costs and stocks, to getting back into service promptly such articles as hot-plates and grill-boilers so that no serviceable components are lying idle. The plates, &c., are therefore stripped, cleaned and reassembled as quickly as possible, returned to stock and drawn upon for outside maintenance and for use in the shop. Control units are thoroughly renovated and, where necessary, the hobs, legs, etc., are sent away for vitreous re-enamelling, the latter being one of the few processes not carried out in the shops. Cooker shells and such parts as door pads, &c., which require cleaning are given the necessary treatment in the cleaning section before being passed on to the assembly section.

Plating and Tinning

Portions of the cooker which require plating, such as oven hangers, shelves, thermometer cases, grill pans, drip trays, &c., are handled in a special plating shop which is walled off from the remainder of the building. Articles to be treated are first stripped and cleaned ready for plating. Oven hangers, shelves, &c., are given a dull nickel finish, bright nickeling being preferred for such parts as thermometer cases and oven vents. Tinning is employed for grill pans and drip tins.

The reconditioned shells and the loose components are now all ready for reassembling. The lagging of the ovens and doors is examined and replaced if necessary, while any mechanical defects discovered in any of the components are dealt with in a fitters' section adjoining the assembly bay. This fitters' section is equipped with all apparatus (including welding plant) likely to be required in undertaking minor repairs, fitting thermostatic oven control, &c. The cookers are then reassembled and wired up.

Assembly completed, all cookers undergo a routine 1,000-V flash test to ensure that the insulation is in order. Circuit testing follows and after this there is a general inspection for cleanliness, completeness and correct fitting of the various parts. Having been passed for service, the cookers are arranged in the stores according to their types. The spare part bins are so placed that spares are stored adjacent to the types of cooker for which they may be required.

Other apparatus is handled in much the same way, except that generally the reconditioning process is not so complicated. Wash boilers are not as a rule stripped right down but are thoroughly cleaned, the insides retinned electrically, the outsides sprayed with aluminium paint, reassembled, tested and returned to stock. The treatment of self-contained water-heaters includes descaling, the retinning electrically of the inner container, and the spraying of the outer containers.

Kettles are perhaps the appliances which most obviously benefit from their reconditioning treatment. When they are seen in the battered and tarnished condition in which they sometimes arrive, it seems almost incredible that they will ever be made serviceable again. Yet after all the dents have been knocked out, the spouts straightened, the insides retinned electrically, the elements nickel plated, and the bodies re-polished, it is almost impossible to distinguish them from new. In connection with the renovation of radiators, plant is provided for copper plating and oxidising.

In a normal week about 100 cookers are dealt with as well as 25 wash-boilers, 30 radiators and 170 kettles, and in this work no fewer than a thousand parts pass through the plating department. All the apparatus when returned for reissue is not only in first-class condition, but in many cases has been modernised to conform with present-day standards. No hired equipment which does not conform with I.E.E. Regulations is permitted out of the works.

To give an accurate and immediate picture of the work of the department, a series of graphs is kept showing week by week the numbers of cookers, kettles, wash-boilers and radiators (*a*) awaiting attention, (*b*) issued, (*c*) returned for reconditioning, and (*d*) reconditioned. These graphs, placed conspicuously in the main gangway, are not only in constant use by supervisors, but also by the workmen who take a pride in seeing that production is kept up to standard.

We are indebted to Mr. P. J. Robinson, city electrical engineer of Liverpool, and his staff for their assistance in the preparation of this article.

New E.I.B.A. Branches

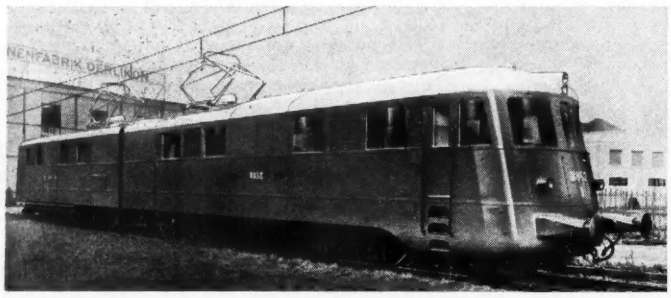
THE Scottish Branch of the E.I.B.A. has recently been reorganised, three sub-committees being formed with centres at Dundee, Edinburgh and Glasgow, working under a main regional committee to cover the whole of Scotland. The chairmen and hon. secretaries of these committees are as follows:—Scottish Region, Messrs. A. Lindsay and C. H. Walker; Dundee, Messrs. D. H. Morris and R. H. Duncan; Edinburgh, Messrs. E. Seddon and J. Stobo; Glasgow, Messrs. H. G. MacKerron and C. H. Walker.

An inaugural meeting was held recently at Preston for the purpose of establishing a branch for North Lancashire and Westmorland, and the following officers were appointed *pro. tem.*: Chairman, Mr. G. A. Robertson, M.Sc.(Tech.); hon. secretary, Mr. C. H. Jones. Arrangements are also being made for new committees in Bedfordshire, Cambridgeshire, Cumberland, Norfolk and Oxfordshire.

POWERFUL LOCOMOTIVE

New 12,000 HP Single-phase Unit for Swiss Federal Railways

DURING our recent visit to the Swiss National Exhibition at Zurich (ELECTRICAL REVIEW, May 26th) we had an opportunity of inspecting the 12,000-HP single-phase locomotive which has been built for the Swiss Federal Railways, the electrical equipment by the Oerlikon Co. and the mechanical part by the Swiss Locomotive and Machine Works. Its general design is based upon that of an 8,800-HP (hourly rating) locomotive which was put into service in 1932 and has now covered about 600,000 miles, but it makes use of only two (instead of four) pantographs.



Articulated electric locomotive, rated at 12,000 HP, recently built in Switzerland

The new locomotive, which is in two articulated sections, is to be used mainly on the Gothard line with long gradients of 1 in 37 and has been equipped with Behn-Eschenburg regenerative braking.

The main particulars that correspond to those of the older 8,800-HP unit are: Catenary line voltage, 15,000; frequency, $16\frac{2}{3}$; length over buffers, 111 ft. $6\frac{3}{4}$ in.; total wheel base, 95 ft. $7\frac{7}{8}$ in.; wheel base of one unit, 41 ft. $0\frac{5}{16}$ in.; diameters of driving and bogey wheels $53\frac{1}{8}$ and $37\frac{3}{8}$ in.; gear ratio (double-reduction) 1 to 3.47. There are two transformer groups with a continuous rating of 7,300 kVA for the 10,600 HP continuous rating of the sixteen motors (two in series), giving a tractive effort in lb. at the wheel rim of 97,000 at 44.5 MPH, 80,000 (continuous) at 48 MPH and 143,000 (maximum) at 68 MPH.

The total weight of the new locomotive is slightly less than 230 tons, of which the electrical equipment accounts for about 110 tons, whereas the corresponding figures for the earlier smaller locomotive were 240 tons and 114 tons. The motors are of the compensated series commutator type with windings insulated with mica only. Each part is forced-ventilated by a fan group which also cools the transformer oil; the fan motors can be connected in series to run at about half normal speed in winter.

On each section is a driving platform from which the two halves (although electrically independent) can be controlled. Speed regulation is accomplished by a recently introduced high-voltage control system. Each transformer group consists of one regulating and two secondary transformers (with secondaries in series) in the same tank. By means of two tap changers in a separate tank the secondary transformers are supplied at various voltages and provide twenty-nine running steps from half that number of high-voltage taps on the regulating transformer. The first three taps give in sequence: earth connection (rail), 80 kVA for auxiliary services at 230 V and a supply for heating services at 840 V. The fourth tap at 1,050 V gives the first running step and provides for heating circuits of 450 kVA and the remaining taps give later running steps from 2,290 to 15,000 V, the last stage making connection with the pantograph current collectors.

Each tap-changer set, consisting of two plate-type selectors with transfer resistors between the taps, is operated by a DC motor supplied from a 36-V battery, in such a way that the tap changers in both sections of the locomotive are in corresponding steps.

In order to bring the regenerative-braking system into use, the driver has only to move the master controller to the zero position, then to turn the regenerative control handle from the motoring to the electric-braking position and finally to advance the master controller to any desired operating position, meanwhile observing the ammeter on the motor circuits. A certain braking force corresponds to each braking step regardless of the speed of the locomotive. It remains almost constant over the entire speed range, we were informed, and the locomotive can be braked to a standstill.

For braking on a 1 in 37 grade, additional apparatus in the form of four braking inductive coils, eight inductive and eight resistance commutating pole shunts is necessary. This apparatus weighs about 6 tons or 2.6 per cent. of the total locomotive weight.

For charging the 100-Ah battery and furnishing energy for the control and lighting circuits a hot-cathode rectifier without regulator is installed in one locomotive section. Two double stage air-cooled rotary compressors (82 cu. ft. per min. at 115 lb. per sq. in.), driven by 220-V single-phase series commutator motors, supply the air for the pneumatic brakes and other pneumatically-operated apparatus. A 36-V 3.5 cu. ft. per min. compressor is also installed for raising the pantographs.

Indication of whether the overhead line is alive is provided by a radio valve supplied with current from the 36-kV battery, a 7-ft. antenna being mounted on the roof of the locomotive. The main power and heating circuits are protected by overload relays which trip the main high-voltage oil circuit-breakers. Only after the master controller has been moved to the gear position can the driver reclose the breaker. About ten miles of cable, weighing $3\frac{1}{2}$ tons, has been installed, most of which is invisible but easily accessible.

Parliamentary News

(BY OUR SPECIAL REPORTER)

IN the House of Commons on July 25th, Mr. John Morgan asked the Minister of Agriculture if he was prepared to reconsider the present basis on which grants were made to land drainage pumping stations so that encouragement might be given to electrical installations which, in turn, would tend to promote electricity supply facilities in the more remote rural areas.

Sir R. Dorman-Smith said he did not think it would be wise or practicable to prescribe any particular form of power for land drainage pumping stations, but he would approve whatever proposals might be most appropriate in the particular circumstances of each case.

Electrical Interference

Mr. Day asked the Postmaster-General what action his department was taking in order to see that owners of electrical plant which caused interference with the reception of broadcast programmes by receiving stations nearby installed some form of suppression apparatus, so obviating this interference and annoyance; and if he proposed to seek any further statutory powers on the subject.

Major Tryon said that where complaint was made of electrical interference with wireless reception, his Department approached the owners of the electrical plant concerned and advised them as to the best method of suppressing the interference. In the large majority of cases the owners agreed to fit suppression devices, although there was no legal power to compel them to do so. Inquiries regarding the possible scope and operation of a new Wireless Telegraphy Bill to deal, *inter alia*, with the question of electrical interference with wireless reception were being actively pursued. The problem was, however, one of great complexity, involving consultation with many interests which would be affected; and some time must elapse before these consultations could be completed.

Radio Amateurs in Wartime

Mr. Bartlett asked the Postmaster-General what steps were being taken to use the services of amateur radio operators in the event of war; and if he was aware that, with little expenditure, a 24-hour service could be maintained even in the event of a breakdown of the grid electricity system.

Major Tryon said that it had been decided, after consultation with the Government Departments concerned, that it would be essential in time of war to close down the wireless transmitting sets used by experimenters. He understood that steps had been taken by the Admiralty and the Air Ministry to enrol a number of suitable wireless experimenters for special duties in time of emergency.

TRADE WITH ARGENTINA

Guidance for British Electrical Manufacturers

By H. C. Siddeley, M.I.E.E. (Buenos Aires).

THE position of the British electrical industry in Argentina is not satisfactory considering the close commercial relations between the two countries. Great Britain buys one third of Argentina's exports and has very considerable local investments which are generally estimated at £400,000,000. Great Britain also leads in the general imports of Argentina.

The figures of British electrical imports include much material sold to British-owned companies, such as the railways, etc., which generally buy through their London offices. If these purchases are deducted from the total it leaves a still smaller amount for the general and local sales. Great Britain also has this further advantage over many other countries that the most favourable rate of exchange is always available for British imports.

The table below shows that the electrical business of this country is chiefly in the hands of the United States and Germany, who between them account for 60 per cent. of the total, their shares being about equal. Against this Great Britain accounts for 15 to 18 per cent. The values are in thousands of pesos ($16-17 = £1).

Year	TOTAL	Great Britain		U.S.A.		Germany	
1935	28,286	5,260	18.5%	8,531	30.2%	7,950	28.3%
1936	34,816	5,403	15.6%	10,639	30.8%	9,735	28.6%
1937	46,305	7,395	16.4%	11,678	25.2%	11,990	26.4%
1938 9 months ...	30,123	Data not yet published.					

Where electrical apparatus forms part of a machine, it is classified under the title of the machine and does not appear in the above schedule. Transformers are often scheduled under heavy machinery. The classification and valuation of electrical materials for duty purposes by the Customs Department leaves much to be desired.

The United States preponderates in accumulators, radio material, refrigerators, etc. Germany's interests are electric lighting accessories, meters, steel conduit, cables and motors. Great Britain has a satisfactory business in cables, dividing this with Germany. The United States' participation in cables is only in telephone cables, showing that trade follows financial holdings as most of the telephone business is owned by the I.T. & T. The latter, however, purchases its instruments chiefly in Belgium and England.

Local Representation

The position of the United States and Germany in the electrical business is undoubtedly due to the large and important local organisations maintained here by leading manufacturers. The United States is represented by the General Electric Co. and Westinghouse; Germany by Siemens-Schuckert and the A.E.G. All these companies have large offices, showrooms and staffs in Buenos Aires, and local representation in all the other large towns. Of these the General Electric Co. and Siemens are the largest, each company occupying a complete building in the centre of the city.

The American General Electric Co. holds representations also for other allied concerns, in many of which it is financially interested. It represents here the British Thomson-Houston and the Metropolitan-Vickers Companies. It has done a very large business in Diesel rail cars manufactured by Ganz & Co., of Budapest, and has already sold one hundred of these coaches to the State and the British railways.

Siemens-Schuckert are associated also with other organisations, such as public works contractors, by which they secure a good deal of important business. Siemens themselves also carry out contracts for all kinds of electrical installations and lifts. In connection with their associated company, the Siemens Bau-Union Co., they have constructed and equipped the Chadopyf underground railways. In addition to the companies above mentioned, Brown Boveri, the A.S.E.A., and Ericsson have their own branches.

The only British manufacturer represented here with its own branch is the General Electric Co., Ltd., here known as the Anglo-Argentine General Electric Co. to distinguish it from the American company. This company has an important branch and showrooms and has the largest share of the general business here. It also represents British Insulated Cables and the Chloride Electrical Storage Co. Other British manufacturers are represented by merchant houses.

Among the imports, cables take the first place, amounting to 26 per cent. of the total ($12,000,000 in 1937). In this class there are also important local works, *i.e.*, Pirelli and Sema, who, however, confine their manufactures chiefly to v.i.r. and lead-covered household cables and flexibles, for which latter there is a large market.

The radio business is the next important with imports amounting to $10,609,000, but if we take into account the number of local manufacturers of radio parts and receivers, this class is no doubt the largest electrical business. This country is certainly radio-minded and there are at least thirty broadcasting stations in Buenos Aires alone. Radio communication by telegraph and telephone is also extending, as in a large, sparsely-populated country such as Argentina, this forms a cheap method of communication. The Radio Corporation of America has an important works here.

In radio imports North America leads with 66 per cent. of the total. The United States supplies 77 per cent. of the imports of accumulators, out of a total value of £270,000. Accumulators and radio apparatus represent 86.5 per cent. of the total of United States imports. They also have a monopoly of domestic refrigerators amounting to $910,000, this amount representing only the machinery side as all cabinets are made in the country.

German Supplies

The German interests are more diverse and are as follows: Electrical accessories (total) 66 per cent., amounting to $1,056,000; meters 62 per cent., amounting to $1,917,000; conduit 77 per cent., amounting to $1,119,000; cables 28.5 per cent., amounting to $3,413,000; and dynamos and motors 37 per cent., amounting to $1,195,000.

These figures extracted from the Argentine statistics cannot be taken as accurately representing the actual values of imports, as each class of material is assessed by the Customs at a definite value per kg. or per unit. These values were fixed originally in 1906, being increased by an all round 60 per cent. in 1916 to represent the war time increase in value. The figures, therefore, are misleading. For example, an electricity meter is valued at approximately 50s., the duty alone being over £1. Imports from Great Britain were shown in 1937 in the Argentine returns as £485,000 c.i.f. value, whereas the corresponding Board of Trade figures are £578,000, f.o.b. British port. The Argentine figures, therefore, can only be taken for comparison purposes.

In previous articles tables were given showing the progress of British electrical imports to Argentina and comparing these with the peak years of 1928-31, which is taken as 100. Those of the following years are shown below as a percentage of this.

Year	1928/31 average	1931	1932	1933	1934	1935	1936	1937
Values as shown in British statistics in £1,000 ...	1,333	736	245	202	296	430	562	578
Percentage	100	56	19	16	23	32.5	42	43.5

There has been a gradual increase since 1933, but the figure has not yet reached the average of 1928-31.

Local Electrical Manufacture

The following classes of goods are produced in Argentina, but some of them are, however, of small importance: Cables (v.i.r., lead covered and flexibles), electric conduit and accessories, incandescent lamps, radio parts and receivers, electric bells and transformers, electric lighting fittings, electric cookers and radiators, water heaters, domestic refrigerators and cabinets, mercury switches, switchboards (using imported parts) and insulated tape. Some of these manufactures are at present small compared with the value of imported materials, but as the general import duty amounts to 42 per cent., there is every inducement to increase production.

In previous articles the importance of giving serious consideration to partial manufacture in foreign countries by British manufacturers has been emphasised. In Argentina there is now a growing tendency towards this. Many types of apparatus are contained in cast-iron or sheet-steel cases, which add considerably to their weight and bulk, thus making freight and duty very high, especially as the latter would be charged at the high rates appertaining to electrical materials. For such materials as domestic refrigerators the cabinets are now all made locally and only the mechanical and electrical parts are imported. This has enabled foreign manufacturers to meet the competition of the locally made ones.

Electric cookers pay a duty of 42 per cent. *ad valorem* and have a very high freight cost, whereas most of their parts are iron castings or sheet steel casings. This procedure also gives

advantage to those firms having their own branches as it would otherwise be more difficult to organise such a combination through a general agent.

There are some classes of imports in which British manufacturers have a very small share, but there is no reason why Great Britain should not increase her sales. In radio, accumulators, conduit, cables and electrical machinery, Great Britain should be able to improve her position after a serious study of the prevailing local conditions.

Accumulators, imported chiefly for cars, are in the hands of the United States because most cars are American. It is reasonable to assume that British makers of batteries could produce the standard batteries for these cars. For the Ford and many other American cars the batteries must already be made in England, and these cars are in general use.

The present time, owing to the restriction of imports from other countries, seems opportune for a visit of representatives of the British manufacturers to this market who could make a complete study of the conditions here and, if found favourable, to set up a complete selling organisation for all electrical materials which could include partial manufactures. There is a fashion even in electrical material, and if British types and makes could once be introduced during a period favourable to their introduction the trade could be maintained even after the present favourable conditions have disappeared. The present time is also favourable as new standards are being set up here by the work of standardisation now being carried on by the Instituto Argentino de Racionalización de Materiales (I.R.A.M.), which will have an important effect in creating local standards and ultimately raising the quality of materials, which would be favourable to British types.

Consumption of Electricity

The figures relating to production and consumption of electricity in Argentina are carefully compiled each year by the local committee of the World Power Conference. The consumption figures for 1936 and 1937 are given below.

	Total millions of kWh	Buenos Aires and suburbs	Percentage of whole
1936...	1,596	1,167	74
1937...	1,729	1,268	74

The population of Argentina is estimated at 12½ millions, and of Buenos Aires and the suburbs at approximately three millions. The consumption of electricity per head of population in 1937 was therefore, 139 kWh for the whole country, and 422.6 in Buenos Aires and suburbs. The consumption was allocated as follows:—Private lighting 32.7 per cent., public lighting 8.6 per cent., industrial power 44 per cent., and transport 14.7 per cent.

In addition to the energy sold by the public supply companies, the Central Argentine Railway and the Lacroze Underground Railway have their own power stations whose output is not included in the above figures. There are also many important companies and works which have their own power stations, such as the oil fields, distilleries, cement works, sugar mills, &c. Among the largest individual consumers of electricity in the capital are the railways, trams, underground railways, and the waterworks.

In Argentina there are over 1,000 electricity supply undertakings, having between them approximately 1,100,000 kW of plant. As the two Buenos Aires companies have between them 730,000 kW, it will be seen how much Buenos Aires predominates in electricity supply in this country. These two companies provide 80 per cent. of the energy sold, and the Cia. Argentina de Electricidad (C.A.D.E.), over 75 per cent. of this.

Of the other supply companies, two American-owned companies control 300, including the next largest towns outside the above. Of these, the Electric Bond and Share Company owns two hundred which include Santa Fé, Paraná, Córdoba and Tucuman, and also Mendoza, which were originally British companies owned by the Atlas Engineering Co. The other company the Cia. Sudamericana de Servicios Públicos owns one hundred of lesser importance. This company is managed by the South American Utilities Corporation, which is an offshoot of Stone & Webster Management Corporation. Few of the remaining plants are of more than 100 kW.

There is no general control of public electricity supply by the Federal Government; it comes under provincial control. Each municipality can, therefore, make its own regulations, which has not been up to now to the benefit of electrical development generally. Attempts have been made to develop co-operative electricity supply companies in competition with existing undertakings, but few have been successful; the only effect has been unrestricted competition in prices which has proved to be unremunerative to both parties.

The Province of Buenos Aires has recently made regulations covering all supplies in this province, which is one step in the direction of unified regulations, thus putting the supply industry in a better position.

On account of the importance of the British railways in Argentina to the electrical industry, their developments are interesting. The Western and Southern Railways originally installed their own power station chiefly to supply the Western Railway electrified section, but also for supply to the workshops. This supply was at 25 cycles. Some years ago the company sold its station to the C.A.D.E., and arranged to take all its electricity from that company. Recently it has been decided to change the system of supply to 50 cycles, which is the local standard, and the company is now changing over the sub-stations of the Western Railway electrified section which contained 25-cycle rotaries to 50-cycle mercury-arc rectifiers. All motors, &c., in the Buenos Aires area will require to be either rewound or replaced.

The Central Argentina Railway, which has also an important electrified suburban service, has its own 25-cycle power station, which it is now enlarging by the installation of two new 10,000-kW turbines, and taking out three of the original smaller sets. Parsons turbines and Babcock and Wilcox boilers are again being used.

Water Power

There are several large sources of water power in Argentina but all of them are situated at least one thousand kilometres from Buenos Aires, which is the only centre where there is a large demand for electricity sufficient to justify a hydro-electric scheme. Various surveys have already been carried out as to the possibility of the use of water power in Argentina, but it has been found that the distances are too great to guarantee any satisfactory financial results. A study has also been made of the possibility of transmission by high-voltage DC, but it has been found that this system has not been sufficiently perfected to be available.

Before a manufacturer can determine if any country offers sufficiently attractive opportunities for the sale of his products, it is essential to study the general conditions of the country's trade and all other factors which may have a bearing on its possibilities. Argentina, being generally an agricultural country depending chiefly on its crops and cattle, varies more year by year in its prosperity than industrial countries. Prominent Argentines think that their country is capable of becoming both an important industrial as well as an agricultural country. There is no local coal or metals such as iron, copper, &c., but the extra cost of transport of such materials in these days does not prevent the establishment of industries provided that there is suitable labour and a sufficient demand.

It is a national characteristic to spend freely when times are prosperous, so that the demand for imported materials rose considerably in 1937 and to such a degree that sufficiently quick deliveries of materials ordered could not be obtained. The bulk of the materials therefore ordered in 1937 did not arrive until the beginning of 1938, by which time it was found that the 1938 crops would be disappointing and the purchasing power restricted. In addition to the increased general demand the Government and other public bodies had embarked on very ambitious schemes of public improvements and new buildings, all of which increased the demand for imported materials, of which much was electrical. As an example, the importation of conduit increased by about 50 per cent.

Import Control

The importation of any goods is now prohibited without a previous permit, but even this permit, when granted, does not necessarily carry with it the right of exchange at official rates. Under this system the United States, Italy and Japan are suffering as their trade will be reduced in value in proportion to their purchases.

The exchange provided by Great Britain's purchases is not all available for the purchase of British materials, as this has also to provide the exchange necessary to pay interest on British capital invested in Argentina. Whilst deploring this artificial system of control of trade the system of import permits should be advantageous to Great Britain, which is the largest purchaser of Argentine products.

Argentina is not yet an important industrial country, but owing to the possession of quantities of scrap iron and steel, whose exportation is prohibited, there is now under construction an important steel foundry and rolling mill to make use of this scrap for the production of rolled sections, bars, rods, &c. There already exist similar works, some of which use electric furnaces for making steel castings. All such developments must increase the demand for electrical plant.

The largest buyers of electrical plant and apparatus are the electricity supply companies, railways, oil fields, and industries. The sugar refineries use a large amount of electrical power, but they are now well equipped. As the capacity of their plant is above the requirements of the country, little extension can be looked for in that direction. This business and that of cement production are maintained by high import duties, so their output is limited to the local demand.

MULTIPLE-EARTHED NEUTRALS

Effects on Water Supply Systems

By T. C. Gilbert, A.M.I.E.E.

REVIVED interest in multiple-earthed-neutral (hereinafter referred to as the m.e.n.) and bare neutral wiring was evident during the recent E.C.A. Conference at Brighton from references both in the technical papers themselves and in the subsequent discussion. Unfortunately, the latter was too brief for serious treatment of this important subject, and further consideration should be given to it before opinions are formed. There are only a few isolated examples in this country (*e.g.*, Farnham, Leatherhead and Sevenoaks), and so data has to be obtained from experience abroad, chiefly in America and the Dominions.

A statement emanating from the National Electrical Manufacturers' Association of America says: "Pressure, rather than proof or persuasion, has, in the past few years, been brought upon the electrical industry in Canada and the United States to use bare neutral wiring, the main supporting arguments, forwarded by the supply interests, being that it has had a long, successful and widespread use in England, where it is found cheap and safe, and is now in good repute."

Speakers at the recent E.C.A. Conference advocated a return to some form of bare neutral and multiple earthing. Mr. Gilbert states the case against the system based mainly on American experience.

My comment here is confined to the way in which the proposal concerns primarily non-electrical interests. In Australia the m.e.n. has now been abandoned. In Melbourne it is barred from all metropolitan areas because of its liability to pick up stray currents, especially from traction systems, to aggravate electrolysis, to overload neutral lines and earth connections, and ultimately to result in the disappearance through electrolytic corrosion of earth electrodes at the point of discharge. The State Commission of Victoria states: "M.e.n. in the rural areas has been abandoned as we have found earth leakage protection superior in every way. The dependence of protection upon the continuity of the neutral conductor could no longer be contemplated with equanimity."

In the United States the Report of the Committee on Electrolysis and Electrical Interference, presented before the Annual Convention in 1935 of the American Water Works Association, provides informative reading. (It is obtainable from the offices of the Association, 22, East 40th Street, New York; other relevant information is also freely available from the same source.)

Fifteen years or so ago, when the American Water Works Association was first requested to sanction protective earth connections on water pipes as the only practical means of protecting life and property against high-voltage hazards, it was argued by the interests that the practice would entail no danger, inconvenience or difficulty to the water authorities because under normal conditions no electric current would flow on these connections. On this basis, and this only, the Water Works Association in 1920 appoved the connecting of the secondary systems of lighting transformers to water pipes.

Water Companies' Complaints

This more or less unrestricted endorsement of this form of protection led to indiscriminate earth connection. In fact, certain electrical interests assumed that this sanction gave them an unconditional licence to use the water pipes as an essential current-carrying part of their electrical circuits and proceeded to do so. A steadily increasing number of complaints regarding shock and other hazards was recorded by the water authorities and attributed to the establishment of neutral earths on their pipes. In addition, there was a growing realisation that existing trends in the electrical industry were towards the use of types of wiring and systems of distribution which necessarily increased stray currents on water pipes.

In 1927, therefore, the Association modified the 1920 resolution by adding as a proviso that "The American Water Works Association approves the practice of grounding the secondaries of lighting transformers on water pipes for the purpose of safeguarding life and property, provided that appreciable electric current flows over such ground connections only during comparatively short and infrequent intervals when the ground connections are fulfilling their specific protective purposes, and provided that such ground connections impose no responsibility upon the pipe owning company." The 1927 resolution also stated that the Association was opposed to the use of water pipes as electrical conductors, except as above, and that "since experience with certain power distribution practices which have come into use has shown that grounding may result in hazard to the pipe structures and water works employees, it hereby withdraws its former general endorsement of grounding to water pipes."

In the 1930 edition of the National Electrical Code, Article 9 was modified to provide for the elimination of current-carrying earth connections and the adoption of alternative paths where objectionable current flow had occurred.

These provisions of the Code have not been complied with, however, and even in special cases where stray currents have proved a serious hazard to the pipes, it has been found impracticable to secure the removal of the current-carrying connections, because of the apparent lack of definite responsibility for them. Generally speaking, the individual property owner appears to be charged with the responsibility of installing earth connections originally to a water pipe service if one is available, before the electricity supply authority will grant him service. The supply authority, however, accepts no responsibility for the effectiveness of such earth connections and will not remove those found to be carrying objectionable currents. The only remedy seems to be a direct request to individual property owners to stand the expense of supplementary changes after having initially paid for an approved installation. In addition, the adequacy or safety of the alternative method adopted by the uninstructed property owner is necessarily an open question.

To-day, where adequate studies have been made, the existence of substantial stray electric currents on many water-pipe earth connections, even under normal operating conditions, is admitted. At the 1935 meeting of the Electrical Committee of the National Fire Protection Association, which prepares and issues the National Electrical Code, the representatives of the electric light and power group used the existence of these large stray currents on water pipe earths as their main argument for the adoption of a form of interior wiring which inherently makes house piping and other house metal-work systems a part of the electrical distribution system.

The Bare Neutral

This form of wiring, known as "bare neutral interior wiring," involves the use of one or more insulated conductors and a bare or uninsulated neutral. To prevent arcing and heating at points of accidental contact between this bare neutral wire and electrical conduit, house piping and other metallic structures, direct metallic connection is advocated at accessible points. The house piping, conduits, and other metallic structures are therefore electrically in parallel with the neutral conductor, and may carry a substantial part of any current flowing in the neutral. An investigation recently made on bare neutral installations by Underwriters' Laboratories, Inc., at the request of the Edison Electric Institute, revealed that in 65 per cent. of the tests reported the house piping and other metallic structures carried from 25 to 100 per cent. of the total neutral current.

Definite opposition to bare neutral wiring was expressed by a sub-committee reporting on this subject to the Electrical Committee of the National Fire Protection Association but its recommendations were over-ridden by the main Committee, and the National Electrical Code was modified to permit further extension of the use of the bare neutral in cooker and water-heater circuits. This change in the Code was objected to by the water interests, as these circuits carry heavier electrical loads than ordinary house circuits. In the case of water heaters the bare neutral was to be directly connected to the water pipes at the heater.

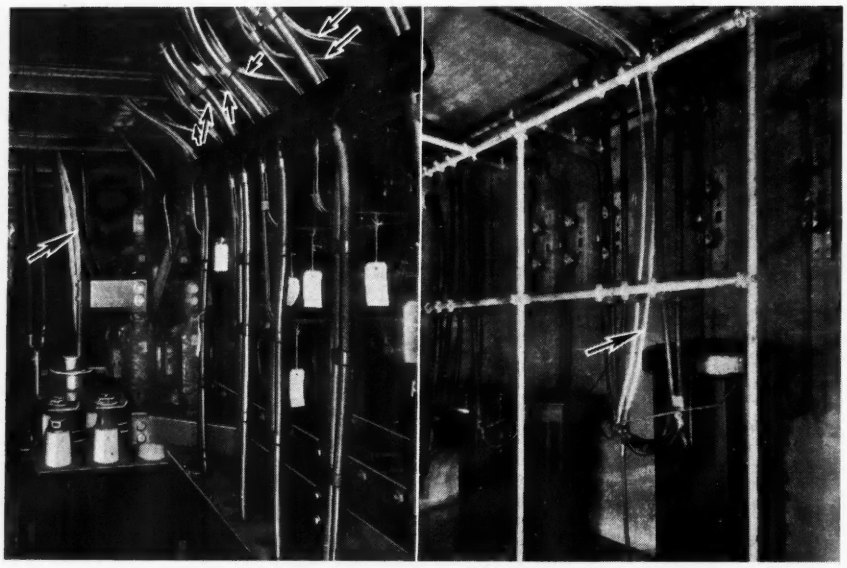
Subsequently, however, the Electrical Committee decided not to permit the use of bare neutrals for water heaters, and to restrict their use to cooker circuits installed with a cable having a non-metallic outer covering. This means that the neutral of the cooker circuits will have an outer covering of non-conducting braid only, whereas in the approved method of house wiring both the line and the neutral conductors must

have a specified thickness of rubber insulation plus an outer braid.

The Committee on Electrolysis and Electro Interference complained that, although represented on the Bare Neutral Committee and on the Grounding Sub-committee, it had no representation on the Electrical Committee itself. It urged aggressive action by owners of waterworks systems in co-operation with other interested parties, and attention was drawn to resolution opposing bare neutrals passed by the National Association of Master Plumbers and the American Society of Sanitary Engineering. The Committee believes that the American Water Works Association should rescind all general sanction of earth connections from electrical systems to water pipes, and the individual water undertakings which permit them for protective purposes, should do so only under the most rigid restrictions and supervision and with the question of responsibility legally defined.

It is recommended that where bare neutral interior wiring is installed, the operator of the waterworks systems should prohibit the attachment of earth connections to the water pipes from electrical systems, and should insist upon the installation of an approved type of electrical insulating joint in the water service pipe at some point between the water meter and the street kerb.

The Report concludes with a reference to an Act in force in the State of Washington which is held to meet the requirements very well. Waterworks operators are urged to endeavour to secure ordinances preventing the connection of any conductor of any electrical circuit with a pipe connected with a waterworks piping system without the consent of the waterworks department. It is further recommended that protective ground wires should be equipped with isolating gaps to prevent any interchange of stray current over the ground wire under normal conditions or equipped with a suitable circuit-breaker and relay control which will positively disconnect the affected electrical service to the building upon the passage of a relatively small amount of current over the ground wire. Isolating spark gaps are a regular feature of standard telephone line protector equipment, and under normal conditions this cannot result in objectionable stray current interchange over the pipes.



Two examples of the employment of bare neutral wiring

These recommendations of the Committee on Electrolysis and Electrical Interference are at the moment in abeyance pending further investigations. The result of the Association's action was the appointment in 1937 of a committee to investigate: (a) electrical grounding connections made to water, gas or drainage pipes, in respect of the effects of any kinds of electric current thereby caused to flow upon the pipes and the contents of the pipes, and of fire and personal hazards; (b) conditions in the electrical circuits producing current flow over pipes; (c) measurement of stray currents; (d) efficiency of electrical earthing. This committee has amassed a large amount of information regarding cases of sediment in water; blue, green or rusty stains; failure of boiler tubes; service or house pipe corrosion; arcing; and taste and odour of water, the latter including some cases of poisoning.

In 1935, Dr. M. G. Lloyd, chief of Safety Codes, Bureau of Standards, Washington, visited this country and I was happily instrumental in putting him into touch with authorities here with a view to securing views on bare neutral wiring. His report was presented to the N.F.P.A. later, and I have been favoured with a copy; in this, Dr. Lloyd says:—

"Supply for the earthed concentric system is usually through a transformer which steps down the distribution voltage of 230 to 115 V. In other cases permission has been obtained to connect the wiring system directly to the supply mains.

"Inquiry among electrical engineers gave me the impression that this method of wiring was not regarded as first class, had not been widely used, and was not considered for any important buildings. The Chief Electrical Inspector of Factories, Mr. H. W. Swann, of the Home Office, stated that he did not know of any installation of the earthed neutral system of wiring in factories or other industrial plants coming under his jurisdiction. Nevertheless, some installations similar to the one inspected were said to exist in other districts of London, at Gillingham, and other places, and throughout the entire area of a few local supply systems.

"The advocacy of the bare neutral system for the interior wiring of buildings in the United States made it of special interest to investigate the use of this system in England, but its use has been very restricted, and I was fortunate in finding one installation which I could inspect."

Probably the best summary of the position as I suggest it should be considered in this country is found in three paragraphs of a report made by the National Electrical Manufacturers' Association, New York, to an Industrial Commission, on the subject of "Bare Neutral." These are:—

"From time to time for many years in one country or another, various proposals have been made to establish numerous earth connections on interior wiring systems or, which amounts to much the same thing, to remove the precautions against current leakage to non-electrical objects at numerous points, thereby saving the cost of maintaining insulation. Those owning the non-electrical objects in private buildings have not yet had these proposals presented to them for their intelligent consideration by their proper engineers and legal representatives, since thus far the proposals have been dealt with, and accepted or rejected, by the engineers and legal advisers of the electrical industry.

"If and when the electrical industry is willing to pronounce these numerous interior wiring earthing connections unobjectionable—so far as it is concerned—it still remains to learn if these earth connections will also be pronounced or admitted by the other industries and public concerned with non-electrical objects in buildings, as unobjectionable to them. If and when these other industries and the public, properly apprised of the proposal to use interior wiring earth connections, which will permit leakage, and which connections will be difficult and expensive to remove should the leakage thereafter become objectionable—if these other industries and public then approve or acquiesce in such interior earthing connections, points of leakage, removals of insulation, however inaccessible, difficult and expensive of removal—probably no branch of the electrical industry need feel reluctant to join in making use of the reduced cost of interior wiring which results (if any such reduction is actually obtainable in a workable wiring system).

"If and when, by such approval or acquiescence of non-electrical industries and public, such interior wiring connections are legitimatised, this organisation will withdraw its present disapproval. Meantime, this organisation must disapprove such a practice, and in making or supplying products to meet any market demand created for such a practice or to be used in accomplishing such a practice, this organisation disclaims responsibility, engineering and legal."

Finally, two extracts from a report of the Chief Electrical Inspector, Evansville, Indiana:—

"The city is now operating under a new ordinance which does not recognise bare neutrals, owing to trouble experienced in such installations. Bare neutrals have not been permitted for the last two years.

"As fast as any changes or additions are required in such installations, the City Inspector requires these to be carried out with insulated neutral. Two years of the restored standard have brought satisfaction and renewed confidence."

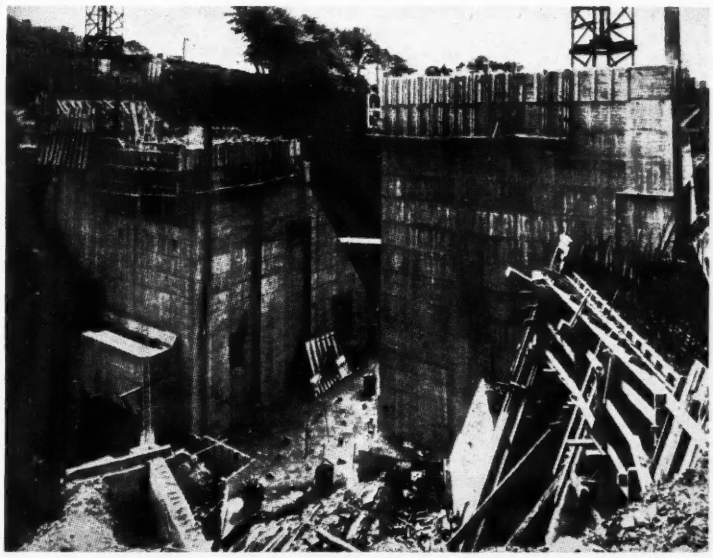
Can we in this country contemplate a loss of confidence, and the loss of public water mains for earthing, in exchange for the doubtful benefits of m.e.n. and bare neutral wiring?

ELECTRICITY IN EIRE

Progress of the Electricity Supply Board

PROBABLY the most striking feature of the annual report of the Eire Electricity Supply Board just issued is the marked increase in the sales of electricity. For the year ended March 31st last the consumption totalled over 295 million kWh, more than 50 million kWh above the 1937-38 figure. The progress was fairly general throughout the various classifications of consumers, the only one showing a reduced consumption being traction, which was 16 per cent. down due to the gradual change-over of trams to oil-driven buses.

The major portion of the increased consumption is attributable to a greater demand for motive power, an increase of about 35 million kWh being shown on the previous year's sales of 80½ million kWh. Of these 24¼ million kWh represented the sale of power to the new cement industry. Sales of electricity for domestic purposes (84½ million kWh) showed an increase of 12½ million kWh over the preceding year and the improvement was spread over the country as a whole. Exhibitions and demonstrations were a special feature of the year's work.



The dam at Poulaphouca under construction

Consumption of electricity for heating, cooking and water heating by consumers other than domestic show an increase of nearly 15 per cent., the increase in cooking sales reaching the satisfactory figure of 21 per cent. Of special interest is the marked development in the application of electricity as the sole source of heat for laundry processes, some twenty-two installations having been carried out in laundries attached to convents, hospitals and institutions. Another interesting development is the use by dairy farms of electric heating for hot water and steam supply for sterilising purposes. The total number of consumers increased by 15,152 to 160,382.

Towards the close of the year a considerable reduction was made in the price of electricity consumed for general lighting purposes, but this has not affected the income for the year under review. Actually, the gross revenue of £1,915,115 is £178,315 more than in the previous year, the working expenditure rising from £954,064 to £1,029,149. From the gross profit of £885,966 (£782,736) there have to be paid interest, repayment of advances and discharge of capital liabilities acquired with local authority undertakings, leaving a balance of £226,810 (£195,952).

New Developments

Capital expenditure for the year amounted to £821,600 as compared with £751,812 in 1937-38 and brought the aggregate capital expenditure to £14,647,513. A considerable portion of the expenditure went to the extension of plant and new developments. In connection with the Liffey hydro-electric scheme, the work on the erection of the dam and intake to the tunnel has advanced well and will be completed during the current year. The site for the Poulaphouca power station was made ready for the commencement of the excavation. The tunnel to connect this station with the main reservoir will be about a quarter of a mile long: about 20 yd. of the outlet end of the tunnel was completed and at the inlet end a pilot tunnel was advanced for about 33 yd. The diversion channel at the Golden Falls dam is under construction.

Contracts were placed for the mechanical and electrical equipment for the Poulaphouca and Golden Falls stations. The first delivery of plant on site is expected towards the end of this year and it is anticipated that the erection of the plant will be completed by the middle of 1941. At the Poulaphouca station two 15,000-kW units with Kaplan type turbines will be installed, while at Golden Falls two units with Francis type turbines will have outputs of 4,000 kW and 250 kW respectively.

In connection with the Pigeon House station extensions the 20/25,000 kVA steam generator set (No. 6) was erected and placed in commission together with two steam boilers, each of 100,000 lb. per hour evaporative capacity. In addition the coal handling plant was extended and a 25,000-kVA transformer directly coupled with the generating unit was installed. Towards the end of this year a further 20/25,000-kW steam generator set (No. 5), now in process of erection, is expected to be in commission, along with two more steam boilers of 100,000 lb. evaporative capacity. Further plant being installed includes a 1,600-BHP Diesel generator set. During the year nearly 500 miles of transmission and distribution lines were installed. The erection of the new 110-kV lines between Dublin and Dundalk and between Dublin, Waterford and Cork was completed and the Dublin-Dundalk and Dublin-Waterford lines were placed in commission at 38 kV. Materials have been ordered for the projected 110-kV line from Ardnacrusha to Carrick-on-Shannon. The programme for 110/38-kV transformer station development was modified, owing to local load development, to include a new station at Drogheda instead of at Dundalk.

Large Swedish Sub-Station

A RECENT addition to the plant belong to the hydro-electric power station of the Swedish State Board of Waterfalls at Västeras is a 220-kV transformer installation at Finnslätten to which energy from the Stadsforsen power station is to be supplied. According to the *Asea Journal* the main transformer is designed for 60 MVA and a ratio of 205/74 kV. The necessary regulation for maintaining a suitable voltage on the 70-kV network is obtained not by extra tappings on the main transformer windings but by means of a separate regulating set and three shunt reactors, the latter being connected to a tertiary winding on the main transformer.

In respect of output and voltage this transformer is stated to be the largest so far supplied by the "Asea" Co., its total weight being 181 tons, of which 60 tons represents oil. The maximum dimensions, inclusive of bushings, are: length, 27ft.; breadth, 11.8ft.; and height, 26.2ft. On test in the workshops the following guarantee data were obtained for the ratio 205/74 kV: Efficiency at full load and unity power factor, 99.17 per cent.; short-circuit voltage, 12.1 per cent.; no load current, 1.0 per cent.

The regulating set, which is self-cooled and provided with "Asea" galvanised comb-type flanged radiators, is designed as a standard series transformer with the extra tappings for the voltage regulation placed in the series winding and connected to a 77-kV on-load tap-changer for the regulation of the voltage at full load. To render possible the dismantling of the cooling chambers without draining off the oil from the transformer tank itself, the chambers are divided up into groups, each of which can be isolated from the transformer tank by means of special draw-off valves. The three shunt reactors, each for 10 MVA, are self-cooled, oil-insulated and are made up of standard transformer coils surrounded by laminated iron castings.

WAR RISK INSURANCE

Government's Proposals Reviewed

By Barrister-at-Law

THE speech of the President of the Board of Trade on the second reading of the War Risks Insurance Bill contained a comprehensive statement of the Government's policy with regard to the insurance of war risks. The Bill itself deals only with the insurance of ships, cargoes and commodities, but the statement of the Minister went beyond the actual scope of the Bill, and dealt with a subject of more vital interest to the electrical industry, *i.e.*, the insurance of buildings and plant.

With regard to commodities, the Government desired to secure the co-operation of industrialists in providing an adequate supply of commodities for the community in the event of war, but many traders have hesitated to lay in surplus stocks owing to the risk to which those stocks would be subject if war broke out. It was thought by the Government that if some scheme of insurance were devised, traders would no longer hesitate to forward the national preparations in the manner suggested.

Electricity supply authorities will no doubt think it advisable to obtain additional stocks of coal, while it will also be necessary for them to remember that the outbreak of war may interfere with their usual sources of supply for cables and domestic electrical appliances. Such stocks will doubtless be covered by the Bill, which is of a most comprehensive character, leaving it for the Minister to exclude any commodities which he might regard as uninsurable. It was indicated, however, that the list of exclusions from the scope of the Bill would be small.

Registration Scheme

The insurance scheme for which the Bill provides will not come into operation until the outbreak of war, and until then no premiums will be payable. Traders, however, who desire to avail themselves of the facilities for which the Bill provides will, on the passing of the Bill, be entitled to register on the payment of a nominal fee which will vary in accordance with the value of the goods to be covered. Registration will be purely voluntary, but the advantage of such registration is that upon the outbreak of war the commodities of that trader would immediately be covered against war risks, and a policy of insurance setting out the premiums payable would be issued. On the declaration of hostilities the scheme would become compulsory, but those who had not previously registered might find that there was some delay in obtaining the necessary cover for their commodities.

It will probably be generally agreed that the application of compulsion on the outbreak of hostilities is necessary, since it would be entirely uneconomic to permit traders in areas which are not vulnerable to stay out of the scheme, and thus increase the premiums payable by traders in vulnerable areas. It might lead to an undesirable rise in the price of commodities in parts of the country which were most subject to hostile attack from the air. The cover, however, which will be afforded by the scheme will be the full value of the commodities insured.

Plant and Buildings

Considerable concern has been felt by the trading community that in the Bill the Government has made no provision for the insurance of plant and buildings. It is quite obvious that the safety of plant and buildings is far more important to the electricity supply industry than the insurance of commodities. The Government, however, has resisted all suggestions that the risk to which plant and buildings are subject should be covered by any scheme of insurance.

It was pointed out in debate that the total value involved would be over £12,000,000,000 and it would be impossible without dangerously crippling the nation's resources for the Government to support any scheme under which the Treasury should guarantee to meet the loss, or any specified fraction of that loss, as and when it was incurred. Although this is no doubt true, the President of the Board of Trade reiterated the Government's policy in connection with this matter.

In the first place, he reaffirmed that war loss, whether it was incurred in connection with domestic or industrial premises, must be regarded as a national and not as an individual matter. Secondly, he stated that "emergency reconstruction of essential property would have to be undertaken with Government assistance as soon as possible after the destruction of such property occurred." Thirdly, he suggested that "a register of damage done to every kind of property must be promptly made when the damage occurs," and that arrangements had been made through the Valuation Office of the Inland Revenue Department for the compilation of such a register.

In actual practice, this system will have the effect of dividing property into two classes. In the first place there will be essential property, which will no doubt include generating stations and essential electrical plant; where property of this kind was damaged, Government assistance would be immediately available to repair the loss. In the case of the second class of property, *i.e.*, non-essential, a record of damage would be kept, and at the end of the war compensation would be paid from the Treasury at such a rate as the nation's resources at that time permitted.

Domestic Equipment

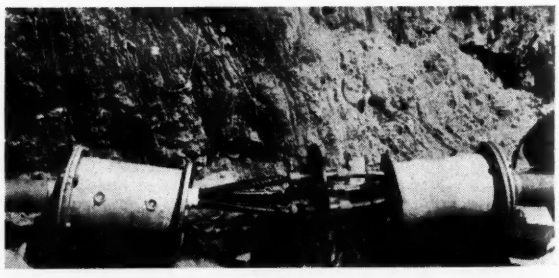
It is not certain to what extent apparatus and appliances upon domestic premises which had been let out by electricity undertakers on hire-purchase terms could be regarded as "commodities," and doubt has been expressed as to what extent they would be insurable under the scheme contained in the War Risks Insurance Bill. They are, of course, an important item in the assets of the undertakers, but it might be considered as somewhat incongruous that the householder should receive no compensation in respect of the loss of his building while the undertakers were indemnified in respect of the destruction of apparatus in the building.

In addition to this scheme, the Government proposes to appoint a committee to investigate a proposal which has been made by a private Member of Parliament. This proposal is based upon the possibility of the formation of some fund out of contributions from property owners, which might or might not receive in addition some contributions from the Treasury. The object of this fund would be to provide immediate assistance to owners whose buildings or plant were destroyed or damaged, in cases where such immediate assistance could not be obtained from the Government.

Such a fund might well be of assistance to industrialists who own premises which could not be regarded as essential to the national well-being, but it is observed that where the electrical system of the country was damaged by hostile aircraft, immediate repair would be necessary, and that the Treasury should, in accordance with the statement of the Government, afford assistance in respect of the consequential expenditure.

Emergency Jointing at Brighton

LAST week in reporting the fire at Southwick power station we referred to the use of cold-setting compound in making high-voltage joints. While in the circumstances some of the joint boxes had to be improvised out of anything suitable that came to hand, such as plain lead sleeves or iron boxes, in several cases the joints were of the type recently devised by members of the staff of the Brighton undertaking for A.R.P. This type of joint, Mr. W. N. C. Clinch (electrical engineer and manager), informs us, was developed before a cold-setting compound was on the market and was originally intended for filling with transformer oil. It consists of a large "Tufnol" disc into which are inserted the copper connections terminating on each side of a split-sleeve contracting connector, into which the conductors of the high-voltage cable are jointed. The body of the joint is of aluminium, cast in the undertaking's own foundry. Compound or oil is prevented from escaping by a piece of petrol-proof hose clamped to the casting and to the cable by means of "Jubilee" worm-drive clips.



High-voltage joint before assembly, with cores completed

CORRESPONDENCE

Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions

Manufacturers' Peaks

WE have read with interest the leading article in your issue of July 21st accurately describing the tribulations that beset the manufacturer of seasonable apparatus.

Electric fire sales in these days of domestic electrification have no close season, but the manufacturer of this particular product is inevitably faced with gigantic peaks, the exact time and extent of which it is always difficult to calculate. The manufacturer's first duty is to estimate the demand, not always a simple process where new designs are concerned. The problem is further complicated by the number of different models, voltages and finishes, all of which have to be budgeted for and produced in correct proportion. Even assuming that these estimated stocks have proved adequate, there comes a time in the peak period when the volume of orders is so great that delay in despatch and transport cannot be avoided.

Happily, the majority of wholesalers and retailers now realise the importance and benefit of placing their orders early. This does not, of course, release the manufacturer from his obligation to build up stocks during the early summer. But, without doubt it relieves the despatch bottleneck which otherwise occurs at the first sign of cold weather. There are still some who delay placing their orders until the last possible moment. It does not seem fair to blame the manufacturer when they and their clients are disappointed.

In the soft goods and many other trades, where indeed fashions are far more fickle than they are in our own, the retailer is obliged to order his requirements many months in advance of the season for which they are intended. The electrical dealer is not faced with the same element of risk; an electric fire, even if remaining unsold after the winter season, does not become obsolete or unsaleable. Who could say the same of, for instance, a woman's hat?

However, this is the manufacturer's Utopia which we are not suggesting should be applied to the electrical trade. We agree with the concluding paragraph of your article, in which you imply that anticipation and co-operation on the part of both wholesale and retail trades goes far towards reducing the manufacturer's production costs and improving the service which he can render.

BERRY'S ELECTRIC, LTD.
Raymond Berry,
Director.

London, W.1, *July 21st.*

The Uninsulated Return

I am in agreement with Major P. A. Smith in advocating the use of an uninsulated return conductor on AC systems. In your issue of August 31st, 1934, I stated its advantages for underground mains and demonstrated how the reactive effect of the armouring (particularly steel tape) made it a semi-insulator and so confined the greater part of the return current to the cable. This phenomenon is even more marked with conductors drawn through steel tubing as the following simple experiment shows.

Draw two lengths of wire through a tube and connect to a source of AC supply at one end and to a load at the other (a large radiator will do) with an ammeter in the return conductor. Run a third wire outside the tubing and connect it in parallel with the return conductor with a second ammeter or a switch in circuit. Then switch on the supply and note the two readings or, if a switch is employed instead of the second ammeter, switch in and out the conductor outside the tubing and note the difference in the readings on the one ammeter.

This experiment is intended to reproduce as nearly as practicable the actual conditions that would obtain with an uninsulated return conductor. Insulated wires should, however, be used in order to make the readings of the ammeter convincing and to comply with existing regulations. The external wire, of course, represents the conductivity of the earth or earthed materials, but it probably has a much lower resistance than that usually obtained inside a building as otherwise earthing to a water pipe would be unnecessary. With an uninsulated return an additional earth connection will not be required except at the transformer station for the district.

This result shows that much money is being wasted on unnecessary insulation on AC return conductors and that regulations which require insulation on AC return conductors in armoured cables running only half a mile or so from a transformer sub-station and yet permit uninsulated returns on miles of DC railway and tramway routes, are straining at a gnat and swallowing a camel.

I can agree with Major Smith in his preference for house transformers only in so far as it relates to thinly populated districts where there is a considerable frontage between consumers. The 2-kV or 3-kV single-phase system with house transformers is still, I consider, the most flexible and efficient system of distribution in these circumstances. Moreover, for these voltages high-rupturing-capacity fuses can be obtained at a reasonable price and occupying a comparatively small space.

Where houses are clustered together, however, as in most residential districts there is little doubt that low-voltage mains with transformers in kiosks or sub-stations provide the most efficient form of distribution. In addition to the higher efficiency of a single large transformer its capacity would be far less than that of house transformers in the aggregate owing to the diversity of the consumers' demands.

B. S. HORNBY.

Bournemouth, *July 18th.*

Supply Management

The controversy as to whether the engineer or the commercial man is best fitted to manage a supply undertaking has no doubt arisen from the recent tendency for some of the most important positions to go to men with little, if any, engineering knowledge. The whole question boils down to considering whether the man who enters the industry in the commercial sections can absorb sufficient technical knowledge to enable him to take over the management, or *vice versa*. The characterisation of a commercial man as a "mere clerk" incapable of understanding technicalities is something which a wise man would not take too much for granted.

In 1933 a controversy was conducted in these same columns regarding the question of the Institution modifying its curriculum in the case of those specialising in development. I suggested that some of the best developed undertakings had never had recourse to selling methods and contended that it would be unfair to admit people to A.M.I.E.E. status who had only a surface knowledge of some important matters connected with the technical aspect of electricity supply.

Having since that time seen much evidence of the appalling mismanagement of undertakings by otherwise excellent engineers I have modified my views to this extent—that it is desirable for the Institution to adjust its curriculum to the extent of providing means of distinguishing between those who are likely to make sound administrators and those who are not.

The exploitation of the "market" requires some commercial assistance no doubt, but I personally deplore the attempts made to over-commercialise the industry. So eager is the industry to unload its produce that many undertakings are selling energy to domestic two-part tariff consumers at less than cost; it is only possible to do this whilst the flat-rate and industrial consumers exist to subsidise the two-part tariff consumer. Economically, such a policy is unsound and can only lead eventually to increased tariffs.

It matters not how a man has reached the managerial chair so long as he has the required knowledge and ability, but he must represent a policy which is technically, commercially and economically sound because even in monopoly industries the profit test remains.

BERNARD POINTON.

Salford, *July 21st.*

Flames and Furnaces

AN International Conference on Flames and Furnaces will be held from September 17th to 20th next year at the Royal Institution in London. The Institute of Fuel is convening the Conference and Mr. S. McEwen, vice-president, is chairman of the executive committee. The British Coal Utilisation Research Association is responsible for the technical programme, which has been prepared by a committee of thirty engineers and scientists under the chairmanship of Mr. J. G. Bennett, director of the B.C.U.R.A. Flames in the internal combustion engine and explosive flames generally are excluded from its scope, which will be concerned with the free combustion of gases, liquids and solids in air, one object being to draw attention to the almost unexplored field in engineering that has been opened up by progress in the study of flame by chemical kinetics and spectroscopy.

NEW ELECTRICAL PRODUCTS

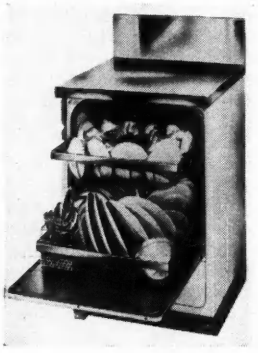
A Review of Equipment Recently Marketed

Domestic Dish Washers

TWO Westinghouse domestic electric dish washers have recently been introduced by the LIGHTFOOT REFRIGERATION CO., LTD., Abbeydale Road, North Circular Road, Wembley, Middlesex, one of the cabinet type with a drop-down door at the front, and the other a portable equipment on four roller wheels with a door at the top.

The fixed model holds 57 articles of crockery and glassware and requires 5 to 6 quarts of water for each wash or rinse. It has two dish racks, a silverware basket, a dish scraper, measuring spoons, drain and filler tubes and a combination fill and drain fixture. It measures 24 in. wide, 24 in. deep and 34½ in. high.

The portable model holds 50 pieces and requires about 5 quarts of washing or rinsing water. The accessories include a silver holder, a dish scraper and measuring spoons. The equipment measures 36 in. high and 22¾ in. square.

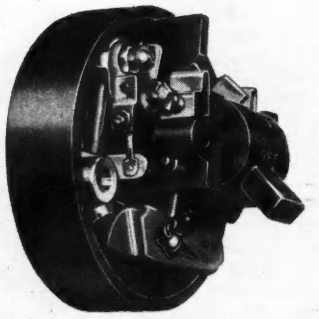


Stationary model Westinghouse washer.

Both cabinets are finished in white "Dulux" and the dish-tank interior of the stationary model and the top cover and washing compartment of the portable model are finished in acid-resisting white porcelain enamel. The portable model is filled from a faucet through an adjustable swinging arm. The motor driving the impeller which swirls the water over the dishes in each case is a ¼-HP, 230/250-V, 50-cycle, AC unit.

A Miniature Circuit Breaker

The "Nodark" circuit-breaker produced by the POWER EQUIPMENT CO., LTD., Kingsbury Works, Kingsbury Road, N.W.9, has been designed primarily to supersede fuses and non-automatic switches. It is a single-pole unit, compact and robust, and is suitable for use on AC and DC with a safe current-carrying capacity of 15 A at 250 V.



Standard "Nodark" circuit-breaker

Similar to a standard 15-A tumbler switch, it has a highly polished black bakelite case of 2⅝ in. diameter. The cover is easily removable by the withdrawal of two screws, giving immediate access to the terminals, main and auxiliary contacts, tripping device, overload adjustment, time lag, &c.

The standard model is arranged for back wiring and has terminals similar to those of a standard 15-A tumbler switch, with two back terminal stems for switchboard mounting if desired. A stormproof model has a standard bakelite case mounted in an outer case with a base-plate and cover of high-quality cast-iron.

The cover, which has "on" and "off" indications, is secured to the base-plate on a wide machined joint by four fixing screws. The base-plate contains an insulating panel carrying two stout pins which engage with the terminals of the standard circuit-breaker and provide the sole means of fixing the unit in the cast-iron case.

The tripping mechanism is of the free-handle type, leaving the overload release free to trip the circuit-breaker immediately contact is made, independently of the position of the operating lever. The overload coil calibration is adjustable from full load current to 100 per cent. overload. A lead plate on the iron armature reduces hum on AC. The time-lag is of the thermal bi-metal strip type.

New Thermostatic Bi-metals

HENRY WIGGIN & CO., LTD., Thames House, Millbank, London, S.W.1, have recently introduced twelve grades of "Wilco-Wiggin" resistance "Thermometal" which has been specially developed to meet the demands for specific thermostatic bi-metals for electrical overload protective devices. They provide, it is claimed, a wider range of resistivity than has hitherto been available, the figures varying from as low as 5 microhms up to 93 microhms per cm. at 70 deg. F.

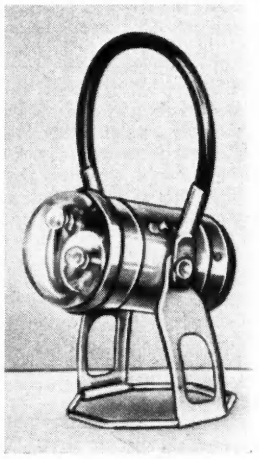
These materials have been carefully graded according to the requirements of various designs of thermal overloads, and the temperature deflection constants are approximately the same throughout the range. High and uniform deflection is obtained with the minimum rise in temperature, thus facilitating calibration and rendering manufacturing tolerances less critical. The good mechanical strength of this series of bi-metals enables the blade to operate the tripping mechanism without undue flexing and without overstressing the element.

Emergency Lanterns

Three "999 Supreme" emergency lanterns which have been introduced by L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, Kingsway, W.C.2, are designed to afford the greatest possible adaptability under various emergency conditions, particularly in connection with A.R.P. and allied work.

They can be suspended from the ceiling or wall for general illumination in shelters, &c., and while mounting a ladder a lantern can be swung from the arm, leaving both hands free, and the light can be suspended in any position.

The "Twin-lite" model has two lamps, one with a highly polished powerful reflector for spotting and the other with a polished flood reflecting surface. Both lamps are controlled by the same waterproof switch. With the "Focal-Ray" model a 1,000-ft. long concentrated beam can be changed to a bright floodlight by a slight turn of the head lens. Exceptional flexibility is the keynote of the "Pivot-lite" model, which has a highly polished non-tarnishing parabolic reflector. In all three models the body, base and handle are joined with a permanent and uniformly tensioned pivot.



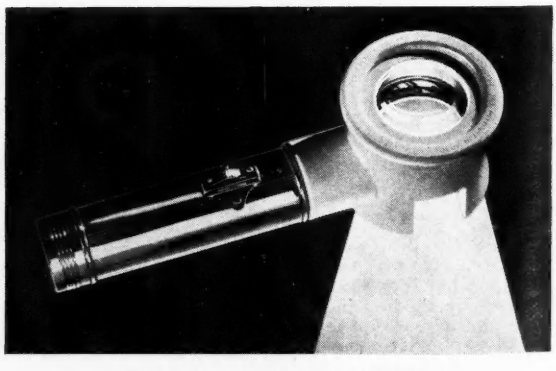
"999 Supreme" emergency lighting lantern

Illuminated Magnifier

Although it was introduced primarily for use by the medical profession, the Partington illuminated magnifier, which is available from the patentee, Mr. S. W. PARTINGTON, 96, Gloucester Road, London, S.W.7, is finding an increasing field of service in making minute examinations of engineering and other work.

A bakelite unit fitted with a powerful lens system to give 6.57 linear magnification is attached to the lamp end of a tubular hand torch complete with battery, switch and lamp in such a way that the projection from the lens system for examination is normal to the light projection from the lamp. Hence the lens unit can be held conveniently on the object for examination.

An aperture at the bottom of the wall of the lens container enables work to be done on the object while under magnification with forceps or any other suitable instrument. The lamp, of B.T.H. manufacture, is said to have a true daylight characteristic, and the battery is of the Chloride Company's production.



Partington Illuminated Magnifier

SCANDINAVIAN TRADE

Steady Expansion

LAST year's Scandinavian foreign trade in electrical machinery and appliances improved as compared with returns for 1937. The export trade, practically confined to Sweden and Denmark, advanced by 10 per cent. in respect of value, while import increases varying from 6 to 25 per cent. occurred in Sweden, Norway and Denmark. A reduction of 2½ per cent. in the case of Finland was neutralised many times over by the former increases. A very promising market indeed is offered by the Scandinavian countries to foreign exporters of electrical goods. Their import trade last year was valued at about £8¼ millions, or double the figure for exports.

Sweden spent £4,000,000 on imports, Norway £1,850,000, Finland £1,300,000 and Denmark £1,100,000. The export trade comprised Swedish shipments valued at £3,185,000 and Danish exports of £915,000.

Sweden's Big Turnover

The total value of Sweden's import trade was about 75½ million kronor (£=19.40 kr.), of which goods valued at 43.6 million kr. came from Germany, Great Britain supplying 5.2 millions. Exports were valued at nearly 62 million kr. of which the United Kingdom took 3.4 millions. The import trade showed conspicuous increases with regard to generators, large motors, fans and vacuum cleaners, while a decline occurred in the radio, cable and wire trades. In the official returns the goods are divided into two groups, one according to value and the other weight, as shown in Table I.

The first group shows an increase in value from 41.1 to 43.7 million kr., while in the second category there is a fall from 14,382 to 13,548 tons. As to exports, both groups show an improvement, the former one of 11 per cent., from 43.55 to 48.45 million kr., and the second 2 per cent. from 5,137 to 5,242 tons.

The outstanding change as compared with the returns for 1937 was a steep rise in exports of telephone and telegraph apparatus, as will be seen from Table II.

TABLE I

	Million kr. 1937	1938
Generators, motors, convertors ...	9.2	10.2
Fans, vacuum cleaners, etc. ...	5.3	6.9
Stators, rotors	1.0	1.0
Accumulators...	0.9	1.0
Radio articles...	17.8	16.9
Other special apparatus	6.9	7.7
	Metric tons 1937	1938
Dry cells	856	834
Lamps	91	97
Pocket lamps and torches	305	293
Brush carbons	4,543	4,548
Switchgear	1,703	1,605
Insulators	887	549
Heavy cables	4,982	4,730
Insulated wire	1,015	892

TABLE II

	Million kr. 1937	1938
Generators, motors, convertors ...	16.6	17.1
Fans, vacuum cleaners	12.6	13.0
Stators and rotors	0.75	0.65
Accumulators...	1.8	1.9
Telephone and telegraph apparatus	7.5	10.6
Radio sets	1.6	1.9
Other special apparatus	2.7	3.3

TABLE II (*continued.*)

	Metric tons 1937	1938
Heavy cables	3,715	3,903
Lamps	62	70
Switchgear	1,360	1,269

TABLE III

	Million kr. 1937	1938
Motors...	4.0	3.9
Generators	1.1	2.8
Transformers and heavy switchgear	1.9	2.9
Household switches	0.7	0.5
Radio receivers and components ...	7.2	5.9
	Metric tons 1937	1938
Telephone and telegraph apparatus	246	184
Lamps	119	94
Cables and insulated wire	1,776	2,469
Dry cells	495	564
Accumulators...	694	702
Heaters, irons, etc.	288	242
Lamp sockets...	288	247

Increased Norwegian Imports

Last year's increase in the Norwegian imports was chiefly due to additional supplies of generators, heavy switchgear and cables. Increases have also taken place in imports of dry cells and accumulators, chiefly on account of the popularity of battery-operated radio sets, while imports of foreign receivers, components and accessories were reduced. Details are given in Table III, the first group showing an increase from 14.9 to 16 million kr. (£=19.90 kr.) and the second an increase from 3,906 to 4,502 tons.

Finnish Market Relaxing

The value of last year's Finnish import trade was nearly 292 million Finnish marks (£=226 Fmk.), or about 7½ millions less than in 1937. The explanation may be found in the fact that extensive electrification schemes and work on new power plants were being carried out in 1937, which necessitated large supplies of machinery. In 1938 the pace slowed down, and the result will be perceived in Table IV. It will also be noticed that there was a substantial increase in radio imports bringing with it augmented supplies of dry cells and accumulators. The radio trade proper totalled 94.2 million Fmk., as compared with 81.4 million Fmk. in 1937.

Danish Imports

The value of Denmark's imports rose from 20.5 to 24.6 million kr. (£=22.40 kr.). Exports rose in value from 15.2 to 16.6 million kr. The increase in imports was chiefly due to supplies of cables and wire being more than doubled, and to a substantial increase occurring under the head of household appliances and other electrical apparatus, where a rise of 1.9 million kr., or almost a third of the previous year's total, was recorded. Other details will be found in Table V.

TABLE IV

	Million Fmk. 1937	1938
Electrical machinery	145.6	119.7
Dry cells	11.6	15.0
Accumulators...	8.3	9.4
Cables and insulated wire	43.0	45.0
Lamps	9.4	8.6
Radio receivers and components ...	72.7	83.8
Valves	8.7	10.4

TABLE V

	Million kr. 1937	1938
IMPORTS		
Generators, motors, convertors ...	2.4	2.1
Accumulator plates	0.5	0.9
Dry cells and finished accumulators	0.2	0.2
Lamps	2.2	2.4
Radio sets, components and valves .	4.3	4.8
Telephone and telegraph apparatus	1.3	1.1
Cables and wire	1.1	2.6
Household and other elec. app. ...	6.2	8.1
Wiring equipment and fittings ...	2.3	2.4
	Million kr. 1937	1938
EXPORTS		
Refrigerating equipment	3.6	3.4
Generators and motors	3.0	2.6
Wiring equipment and fittings ...	1.2	1.6
Unspecified electrical machinery ...	7.4	9.2

The "Permatron"

A USEFUL new type of gasfilled electronic valve for control purposes is the "Permatron" developed by the Raytheon Production Corporation, Newton, Mass., U.S.A. It performs the same kinds of service as "Thyratrons" and "Ignitrons," but differs from them in that the discharge through the tube is initiated by an externally applied magnetic field. It is fully described in the May transactions of the American Institute of Electrical Engineers.

In addition to the anode and cathode, which are conventional, the glass bulb contains a cylindrical collector electrode which surrounds the discharge path. The controlling magnetic field is applied through the poles of an electromagnet outside the bulb. All parts which might disturb the proper distribution of the field are made of non-magnetic materials. When a positive anode voltage and a magnetic field are applied, electrons emitted by the cathode are deflected and strike the collector, which is usually maintained at a potential nearly equal to that of the cathode. In this way the electrons are removed from the discharge path before acquiring sufficient velocity to cause ionisation.

Removal of the magnetic field permits the electrons to proceed towards the anode; for each value of anode voltage there is a critical magnetic field intensity (related to the gas pressure within the tube) above which the discharge will not start.

Among the advantages claimed for the "Permatron" are that the control circuit may be insulated from the tube and its associated power output circuit, and is independent of the polarity of the magnetic field; unusual phase-shift control characteristics can be produced, there is no reaction between the tube and control magnet and control can be exercised by moving machinery.

Employment During June

THE *Ministry of Labour Gazette* states that employment in most of the principal sections of the engineering industry showed a further improvement between May 15th and June 12th and was good on the whole. It was very good in electrical engineering and the number unemployed (4,227) represented a percentage of 3.6, which was 0.4 less than in the preceding month and 1.9 less than in June, 1938. In the electrical wiring and contracting section there were 3,956 out of work, or 9.3 per cent., 0.5 per cent. less than a month before and 1.6 per cent. less than a year before. Unemployed in the electric cable, apparatus, lamps, &c., group numbered 9,627 (5.4 per cent.). This was 0.9 per cent. less than in May and 3.7 per cent. less than in June last year.

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

LIVERPOOL Corporation Electricity Committee last week formally accepted the resignation of **Mr. P. J. Robinson,** the city electrical engineer, who is retiring at the end of September, having decided to leave the service on reaching the age of 60. Mr. Robinson's salary is £3,000 a year, and his superannuation will be £2,000 a year. The Committee decided to accept Mr. Robinson's offer to remain with the Department until his successor is appointed if that is necessary. The Committee is to advertise for his successor at a salary of £2,000 a year, and to fix the age limit of applicants at forty-five. The resignation was also received of **Mr. R. E. Rogers,** deputy city lighting engineer, who is retiring on superannuation. Mr. Rogers entered the service of the Corporation in 1893 as a junior clerk, and two years later he was appointed storekeeper of the city lighting department. In 1919 he became works manager, and nine years ago deputy city lighting engineer.

The honorary degree of Doctor of Science of the University of Wales was conferred on **Mr. H. L. Guy,** F.R.S., chief engineer of the mechanical department of the Metropolitan-Vickers Electrical Co., Ltd., at Aberystwyth University College on July 18th. We extend our congratulations to Dr. Guy upon the attainment of this new distinction.

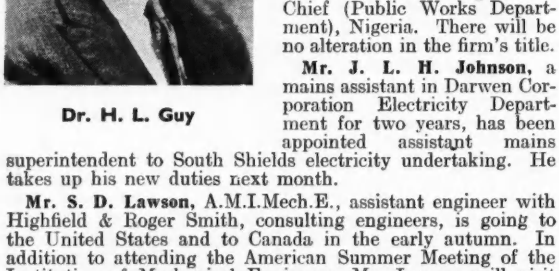
Dr. H. L. Guy

Messrs. Preece, Cardew & Rider have taken into partnership **Mr. J. Bell,** who has been on their staff for many years, and **Mr. C. H. Pickworth,** a former member of the staff and late Electrical Engineer-in-Chief (Public Works Department), Nigeria. There will be no alteration in the firm's title.

Mr. J. L. H. Johnson, a mains assistant in Darwen Corporation Electricity Department for two years, has been appointed assistant mains superintendent to South Shields electricity undertaking. He takes up his new duties next month.

Mr. S. D. Lawson, A.M.I.Mech.E., assistant engineer with Highfield & Roger Smith, consulting engineers, is going to the United States and to Canada in the early autumn. In addition to attending the American Summer Meeting of the Institution of Mechanical Engineers, Mr. Lawson will visit power stations (both steam and water power) as well as manufacturers' works and factories, both in the United States and Canada, to study recent developments.

Dr. A. P. M. Fleming, president of the I.E.E. presented prizes and diplomas at the end-of-term meeting of the London School of Electrical Domestic Science last Friday. He wondered, he said, what the pioneers of electricity would have thought of modern developments. Every progress in civilisation depended on the use of power. The most important application of electricity was in the home, since it was there that the ordinary person was most closely in touch with it. The



Dr. A. P. M. Fleming presenting prizes and diplomas at the London School of Electrical Domestic Science

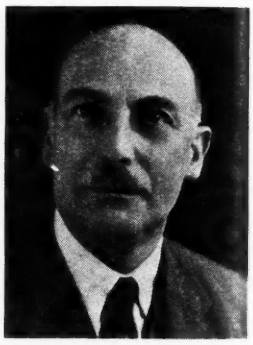
reason it was so long before electricity had become used was that it was somewhat mysterious. The students receiving their diplomas had probed that mystery and were in a position to make full use of the advantages of electricity in their own homes or to pass on their knowledge to others. Speaking on the importance of dietetics, food values and cooking and of the need in time of national emergency for women trained in cooking and institutional management, Dr. Elizabeth Sloan Chesser declared that a woman was second-class if she did not know how to cook a meal. A few words on "home service" work in the United States were given by Mr. D. M. De Bard, development engineer of the Stone and Webster Group. Outlining the objects of the school, Miss H. M. M. Minoprio, the principal, said that it was only a very small beginning in the training of girls who had chosen electricity for their career. In the six years of its existence they had trained three hundred students.

Mr. R. V. Hall, chief engineer to the Sydney County Council, has been selected as the new general manager of the Council's electricity undertaking at a salary of £3,000 a year. He will take control of the undertaking when Mr. Forbes Mackay, the present general manager, retires in October.

About seventy members of the Social Club of the Hotpoint Electric Appliance Co., Ltd., Nottingham, went by motor coach to Hunstanton for their annual outing on July 22nd.

Mr. H. W. Gibbs, electrical and mechanical engineer for the Bengal Nagpur Railway Co., India, went to Australia recently on a twelve months' long service leave prior to his retirement. He is visiting Perth, Adelaide, Melbourne and Sydney, and will then go to South America, South Africa and England.

Mr. A. Clifford, A.M.I.E.E., deputy city electrical engineer at Nottingham, who has retired after forty years' service with the Electricity Department, has been presented with a silver salver and purse of money from the staff and employees of the Department. Mr. Clifford received his training in London and worked in the electrical department of the Great Northern Railway before going to Nottingham. He has been deputy there for seventeen years. Mr. G. H. Lake, city electrical engineer, in making the presentation paid tribute to Mr. Clifford's work for the undertaking and thanked him for the valuable help he had given him since he had been with the undertaking. Mr. Lake also presented Mr. Clifford with a handbag for Mrs. Clifford, subscribed for by the staff. Mr. Clifford is actually retiring next month, but is taking his holiday first.



Mr. M. Wadeson

Mr. M. Wadeson, M.I.E.E., who succeeds Mr. Clifford as deputy to Mr. Lake, has been for the past five years personal assistant to Mr. Lake. He received his education at St. Helen's College, Southsea, and the Municipal College, Portsmouth. He was with the Newcastle-upon-Tyne Electric Supply Co., and also Merz & McLellan, consulting engineers. For twenty-one years he was in business with Mr. W. M. Selvey, consulting engineer of Sheffield and London, and left him to go to Nottingham. Mr. Wadeson served with the Royal Engineers and Royal Tank Corps during the war.

Mr. W. H. Myers, Chief Electrical Engineer of the Department of Railways in New South Wales, is undertaking an eight months' tour of the world to investigate the latest developments in electricity in Europe and America. He will be accompanied by Mrs. Myers.

Mr. G. K. Paton, M.I.E.E., who is a director of the North Wales Power Co., Ltd., has been appointed a director of the British Power & Light Corporation, Ltd.

Mr. W. Thorn, electrical engineer with the State Electricity Commission of Victoria, and **Mr. A. T. Williams,** development engineer of the Melbourne City Council's Electricity Supply Department, have returned to Australia from Germany. The *Industrial Australian and Mining Standard* reports that for six months they have studied earth leakage, particularly methods of protecting large and complex installations.

No nominations having been received other than those proposed by the Committee, the following is the constitution of the Committee of the Meter and Instrument Section of the Institution of Electrical Engineers for the year 1939-40: Chairman: Mr. F. E. J. Ockenden. Vice-chairman: Mr. C. W. Marshall. Immediate past chairman: Captain B. S. Cohen. Ordinary members of Committee: Messrs. A. H. M. Arnold, A. T. Dover, A. Felton, L. B. S. Golds, E. Grundy, C. W. Hughes, A. E. Jepson, F. J. Lane, E. H. Miller, E. W. Moss, A. E. Quenzer, S. H. Richards. The following are ex-officio members: The President, I.E.E., the Chairman, I.E.E. Papers Committee, and Mr. G. A. Whipple (Council Representative).

The Minister of Supply proposes, as the work of the Ministry develops, to associate with it Advisory Panels to assist in regard to the different branches of the work of the Ministry. The first of these will be an Advisory Industrial Panel and the following have agreed to serve on it:—**Mr. G. E. Bailey,** a director of the British Thomson-Houston Co., Ltd., and of the Metropolitan-Vickers Electrical Co., Ltd. **Mr. P. F. Bennett,** president of the F.B.I., and chairman and joint managing director of Joseph Lucas, Ltd. **Mr. O. Boden,** vice-chairman of Morris Motors and managing director of Nuffield Mechanisations & Aero. **Commander Sir Charles W. Craven,** chairman and managing director of Vickers-Armstrongs, Ltd. **Mr. C. R. F. Engelbach,** a director of the Austin Motor Co. **Lord Dudley Gordon,** president of the British Engineers Association; chairman of J. & E. Hall, Ltd. **Mr. A. J. Grant,** member of the Council of the F.B.I., and managing director of Thos. Frith & John Brown. **Sir Alfred Herbert,** ex-president of the Machine Tool Trades Association and chairman and sole governing director of Alfred Herbert, Ltd. **Sir James Lithgow,** chairman of Lithgows and other companies. **Mr. A. C. MacDiarmid,** chairman of Stewarts & Lloyds. **Mr. F. E. Rebbeck,** chairman and managing director of Harland & Wolff. **Mr. J. Rogers,** a director of I.C.I. and other companies. **Lord Woolton,** hon. adviser to the War Office on the production of clothing and textile stores and chairman and managing director of Lewis's.

Dr. H. Jermain Creighton, head of the chemistry department of Swarthmore College, Pennsylvania, since 1928, has recently been elected president of the American Electrochemical Society.

Mr. G. Pegg has been appointed managing director of A. P. Lundberg & Sons, Ltd.

Mr. F. V. L. Mathias has resigned from the North Western District Council and Board for the Electricity Supply Industry, upon his relinquishing the appointment of chief electrical engineer to the Warrington Corporation. **Mr. J. G. Potts,** the borough electrical engineer of Bury, has been elected to the vacancy on the District Council and Board. At a meeting of the group of undertakers concerned a resolution was adopted thanking Mr. Mathias for his services on behalf of the group from 1921 to 1939.

Mr. F. A. Ellis, who was recently appointed deputy electrical engineer at Huddersfield, has been presented with a silver rose bowl by his colleagues of the Yorkshire Electric Power Co. He served with the company for three years as assistant to Mr. W. B. Woodhouse, the managing director. The presentation was made by Col. H. C. Fraser, on behalf of Mr. Woodhouse.

E. K. Cole, Ltd., have appointed **Mr. J. Geddes,** "Benview," Windlaw Road, Carmunnock, Lanarkshire, as technical representative for "Thermovent" heating in Scotland and the North Country. Mr. Geddes was formerly with A. Reyrolle & Co., Ltd., and the J.P. Tubular Heater Co., Ltd.

OBITUARY

Mr. R. Harrison-Watson.—We regret to report that Mr. R. Harrison-Watson, a partner in the firm of John Hunter & Co., Liverpool, died on July 19th. For many years he was secretary and recently chairman of the Liverpool Branch of the Electrical Contractors' Association and he was honorary secretary to the Northern Section, having been a member of the Council for the past six or eight years. He was an ex-vice-president of the Association.

Ald. F. C. Wilson, for many years chairman of the Liverpool Corporation Electric Power and Lighting Committee, died at Liverpool on July 24th. He entered the City Council in 1910 and was Lord Mayor in 1922-23.

Earthing-device Fatality

Judgment in Kettering Case

IN the King's Bench Division on July 21st Mr. Justice Oliver delivered his considered judgment in an action which was tried before him at the Northants Assizes on May 31st. It was brought by the widow of Mr. Cecil A. Reynolds, Desborough, to recover damages for his death against Kettering U.D.C. and Brixworth R.D.C. who were made joint defendants.

The material facts (reported in our issue of June 9th) were briefly as follows:—The deceased man was cutting grass at the rear of his father's house at Oxendon in August, 1937, when the accident giving rise to the cause of action occurred. Electricity had been installed in the house in 1931 by the Oxenden Council, the predecessors of the Brixworth R.D.C. The earthing was by means of an iron bar or pipe inserted in the earth to which were attached bare copper wires, and it was by contact with those wires that Mr. Reynolds was killed. He was found by his father dead with his hand grasping the bare wire. The case against the Brixworth Council was that there was negligence in the earthing arrangements in that the earthing plate should have been inserted vertically in moist earth or earth that was likely to be moist, but was in fact placed horizontally a few inches in dry soil.

In August, 1936, deceased's father had a hotplate installed by a Mr. Bale and it was alleged that this was negligently done in that the switch carrying the supply to the hotplate was inserted in the neutral instead of the live wire and that this made the system defective and there was a leakage. The Kettering U.D.C. (as the authority then was), who were the suppliers of the electricity to the premises, were called in to repair the hotplate and the allegation against them was that they failed to discover the defective state of the installation when carrying out those repairs.

No Contractual Relationship

Both of the defendant Councils denied liability, and after hearing the evidence and the arguments of counsel for the respective parties at the Assizes, Mr. Justice Oliver stated that so far as he could see there must be judgment for the defendants with costs, but as the wording of his judgment needed very careful consideration he would deliver it in London at a later date.

This judgment his Lordship now delivered, and in the course of it he said that he found that the accident was caused by the joint negligence of the two defendants. He could not separate the two causes of action. If the earth plate had been efficient the accident would not have happened nor would it have happened if Bale's wiring had been efficient.

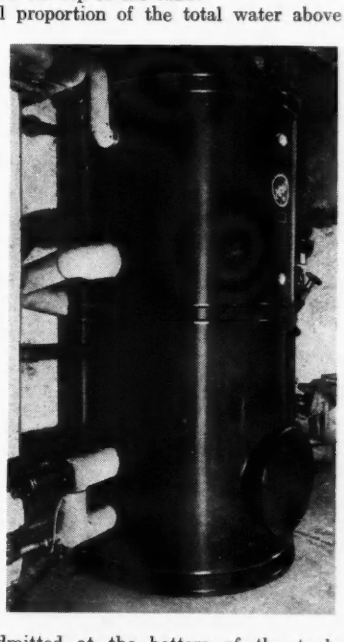
Nevertheless, the plaintiff had to show that the defendants, or one of them, owed a duty to the deceased. He, however, had no contractual relationship with the defendants. He was merely a visitor to premises not in the occupation of the defendants and therefore they owed no duty to any person coming on the premises. His Lordship accordingly gave judgment for the defendants with costs.

New Swiss Water Heater

THE Magro electric water heater, which has been developed in Switzerland for large industrial installations, has its heating coils near the top of the tank.

As soon as the small proportion of the total water above the coils reaches, say, 90 deg. C., a thermostat near the surface starts an electric pump, which draws cold water from the bottom of the tank and discharges it into the top.

When the temperature has dropped, say, to 85 deg. C., the thermostat opens the pump-motor circuit until the temperature has been restored. By this means the temperature of the water above the heating coils constantly ranges between 85 and 90 deg. C., and that of the water below the heating coils varies from a maximum of 85 deg. to the temperature of the water which is admitted at the bottom of the tank.



1,700-litre "Magro" water heater for coffee making installation

When the water is heated throughout the temperature at the top is prevented from rising above 92 deg. C. by a second thermostat which opens the heating coil circuit.

Water at a high temperature either for use as such or for a heating system can thus be obtained very quickly from the outlet at the top. Another advantage of this system is that all the heating coils for a large installation can be installed in a single tank instead of in several heaters in parallel. Additional storage is provided by plain tanks in series with it, the bottom of each tank being connected with the top of the preceding one. The bottom of the last of the tanks, at which make-up water is admitted, is connected with the top of the heater tank through the pump.

A saving of electricity is obtainable by installing additional thermostats (controlling different sections of the heating element) in the bottom of the heater tank and in all but the last of the additional tanks.

COMMERCIAL AND INDUSTRIAL NEWS

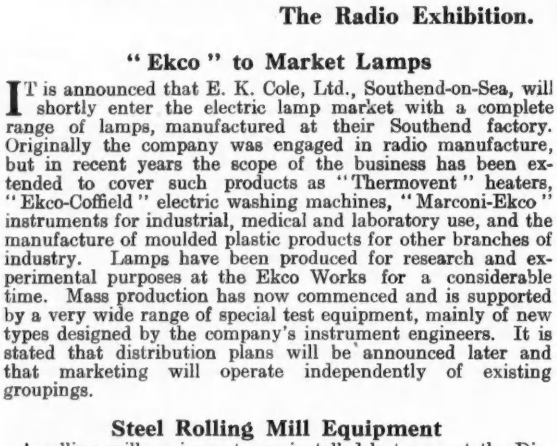
New Zealand Trade Discussions. Electricity in a Steel Rolling Mill. E.D.A. Calendars. The Radio Exhibition. White City Housing Estate.

"Ekco" to Market Lamps

IT is announced that E. K. Cole, Ltd., Southend-on-Sea, will shortly enter the electric lamp market with a complete range of lamps, manufactured at their Southend factory. Originally the company was engaged in radio manufacture, but in recent years the scope of the business has been extended to cover such products as "Thermovent" heaters, "Ekco-Coffield" electric washing machines, "Marconi-Ekco" instruments for industrial, medical and laboratory use, and the manufacture of moulded plastic products for other branches of industry. Lamps have been produced for research and experimental purposes at the Ekco Works for a considerable time. Mass production has now commenced and is supported by a very wide range of special test equipment, mainly of new types designed by the company's instrument engineers. It is stated that distribution plans will be announced later and that marketing will operate independently of existing groupings.

Steel Rolling Mill Equipment

A rolling mill equipment was installed last year at the District Iron and Steel Co.'s Works, Smethwick, Staffs. Supply is taken from the Shropshire, Worcestershire and Staffordshire



Rectifier equipment at a Smethwick steel rolling mill

Electric Power Company at 5,500 V and is controlled by a truck-type cubicle of 250,000-kVA rupturing capacity which feeds the transformer of a 750-kW mercury-arc rectifier with four 390-A glass bulbs. The rectifier provides direct current at 480 V for both units of a tandem merchant-bar and section mill consisting of one 18-in. cogging mill of two three-high stands and one 12-in. finishing train of three three-high and one two-high stands. The cogging mill is direct-coupled to a 350-HP, 300-550-RPM motor through a power plant gear unit with flywheel and has final mill speeds ranging from 69 to 127 RPM. The finishing train is also direct coupled to its motor of 500 HP which gives a range of speeds without gears of from 150 to 350 RPM. The bearing system of the 12-in. finishing train consists of water-lubricated fabric bearings with a view to reducing power consumption, roll-neck lubrication and maintenance.

Speed variation is obtained by motor-operated shunt regulators with push-button control. Electric tachometers enable the mill operators to secure the most suitable rolling speed. The motor starters are of the multiple-lever switch type, all control gear being mounted on one centrally situated DC main switchboard. DC is also provided for the overhead 20-ton crane. For such classes of rolling-mill work mercury-arc rectification has been found to possess advantages. It has a high overall efficiency at the widely varying loads met with (even at ¼ load the figure is 91.5 per cent.) and easily withstands overloads of 100 per cent. for short periods, while a power factor of 0.94 to 0.96 under working conditions, without corrective apparatus, is a valuable characteristic, since electricity is purchased on a kVA basis. The whole of the electrical equipment was manufactured by the Electric Construction Co., Ltd.

Trade with New Zealand

Discussions between Mr. Walter Nash, Minister of Finance and Customs, New Zealand, and British Ministers are set out in a memorandum issued last week. The subject was the effect of New Zealand's import licensing system upon British exports to the Dominion. While it was recognised that it had become necessary for New Zealand to restrict imports to a volume below the high level recently reached, the British Government hoped that consideration would be given to the difficulties which restriction had caused in individual cases. Mr. Nash promised that the New Zealand Government would do its best to meet the representatives of the manufacturers affected. He said that the existing restrictions were to be considered abnormal; his Government's policy was to relax them and ensure the maximum expansion of trade between the United Kingdom and New Zealand. It was not the intention to employ import licences to protect New Zealand industries by preventing reasonable competition, although he admitted that difficulties arose in cases where the Government had incurred obligations to encourage products by restricting imports where it was considered essential. Import restrictions would, however, not be used to foster uneconomic industries. Where it was proposed to grant a limited number of licences for the manufacture of particular classes of goods United Kingdom interests would be given the opportunity of putting forward proposals for undertaking such manufacture.

"Atmite"

There should be many uses for a material whose electrical resistance is an inverse function of applied voltage. "Atmite" exhibits this property to a very marked extent, current increase approximating to the fourth power of applied voltage. Resistance decrease approximates to the third power of applied voltage, so that doubling the voltage will enlarge the current passed sixteenfold and reduce the resistance to one-eighth its initial value. These radical inverse changes are instantaneous, the time-lag being immeasurably small. This silicon-carbide compound can be formed into almost any desired shape and is said to be stable, both electrically and mechanically.

Its properties are described in the May issue of "The Strowger Journal," together with typical applications, including contact spark quenching, limitation of voltage induced in telephone and signalling lines, in gaseous atmospheres, protection of copper-oxide rectifiers, lightning arrestors, automatic compensation for mains voltage fluctuation and production of currents of harmonic frequencies.

E.D.A. Sales and Publicity Programme

Details of calendars available for 1940 appear in the British Electrical Development Association's sales and publicity programme for August-September. Three different designs have been chosen, showing respectively a Dutch indoor study, a seascape and a windmill. They are produced in nine colours, with a tear-off pad for each month, a space being left at the bottom for overprinting. The programme also contains a reference to the carnival car available to members. Over 25,000 applications have been received for the "Cooking with Confidence" brochure.

One of the E.D.A. calendars for 1940

Engineering Scholarships

Following an examination in London last month, in which nine public and secondary schoolboys took part, R. G. Havers, of the Imperial Service College, Windsor, and C. R. Coltart, of Aldenham School, Elstree, have been awarded industrial scholarships by R. A. Lister & Co., Ltd. The winners will be given a four and a half years' course of training in the machine shops and drawing offices in the Lister engineering works at Dursley. During their training, instead of paying premiums as apprentices, they will be paid salaries, which start at £135 a year and rise to £150.

Electric Surface-hardening

It is not easy to harden the surface of steel components uniformly by successively flame-heating and water-spray cooling small zones. More consistency is claimed for an American process, also employed by a British firm, which is referred to in *The Machinist*. High-frequency magnetic induction is employed; a heavy AC of about 2,000 cycles is circulated

through (primary) blocks applied to the (secondary) object to be heat-treated. After a heating period of about three seconds the same blocks spray cooling water for five seconds. This method results in uniform superficial hardening with a penetration of about ⅛ in. For small mass-produced components it would be preferable to grip each separately between the terminals of an electric circuit, which could be made to open so as to drop the heated component into a tank below containing the cooling medium. The terminals should be so shaped as to ensure uniform distribution of the current over the surface "skin" of the component to be treated. For example, to surface-harden the teeth of a gear wheel the clamping terminals should be shaped like a gear. Some temperature gauging device might be added to actuate the securing clamps automatically.

Radio Exhibition

This year's "Radiolympia" will have considerably more interest for dealers than the previous ones. In addition to a dealers' television convention on August 24th, details of which will shortly be issued by the Television Sub-Committee of the Radio Manufacturers' Association, there will be a series of other conventions. On the afternoon of August 30th there will be a discussion on dealers' problems concerning sales promotion, while on the following afternoon technical problems, such as wave-length changes, will be dealt with. Subjects like service and interference will almost certainly be brought up at both meetings. A number of well-known speakers will be present to talk to the dealers and answer their problems. Many dealers will also be interested in the technical conventions which it is suggested shall take place on the evenings of August 28th-31st inclusive, from 6.30 to 8.30 p.m. It is expected that over 1,000 people will take part in these meetings. A "listeners' convention" along the lines of the recent B.B.C. television tea party is also proposed, and the B.B.C. has been asked to co-operate in organising this, but no definite decision has yet been received. Admission to the Exhibition for these conventions is covered by the dealers' tickets (9d. each) and the R.M.A. is also issuing dealers' season tickets (2s. 6d. each). For the television convention special tickets will be available on application.

New White City Estate

Electricity figures prominently at the London County Council's new housing estate, the first portion of which was opened last Friday by the Minister of Health, the Rt. Hon. Walter Elliot, on the site of the former White City Exhibition Grounds. The estate covers an area of about 52 acres and when completed will comprise 49 five-storey blocks containing 2,166 self-contained flats with 7,378 rooms, accommodating 11,000 persons.

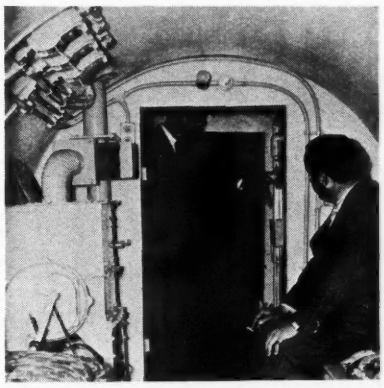
The Hammersmith Borough Council is spending over £30,000 in providing ample facilities for all-electric supply for the whole estate. Tenants can hire all classes of domestic appliances at very reasonable quarterly rates including full maintenance. Electricity is supplied under the Council's standard all-in tariff of ½d. per kWh plus a fixed charge of 7½ per cent. of the rateable value. Collection of both electricity and apparatus hire charges is carried out by means of multi-coin meters, ¼d. being added to the basic charge of ½d. per kWh to cover the fixed charge and appliance rentals. Any excess paid is returned by the collector on the emptying of the meters every six weeks. Some consumers elect to pay for their supplies on a quarterly basis and in this case they receive a rebate of 10 per cent.

Three-phase, four-wire distribution is employed throughout the estate, the low-voltage mains being laid along each side of the streets and a service provided to each block of flats. Heavy rising mains are installed with special flush distribution boards incorporating English Electric h.r.c. fuses constructed by British Insulated Cables, Ltd., to meet the Borough Council Electricity Department's requirements.

Two sub-stations, one of which has already been completed, are of sufficient capacity to supply the full all-electric demands of the whole of the consumers on the estate and to supplement the existing supply on adjoining L.C.C. estates. Equipment of the sub-stations includes Statter extra-high-voltage switchgear, Lucy's low-voltage switchgear and Bonar Long 3-phase transformers. For the public lighting of the estate about forty G.E.C. "Hackney" type lanterns with gasfilled lamps have been installed.

Well-equipped A.R.P. Shelter

Two sources of electric lighting (mains and storage battery supplied through trickle charger), thermostatically controlled tubular heating, air filtering and conditioning equipment and sump pumps are some of the electrical facilities in an air-raid shelter just completed at Leicester for Mr. W. J. Lorrimer, a director of Pool, Lorrimer & Tabberer, hosiery manufacturers. The shelter, which could accommodate ten persons for an indefinite period, has been constructed completely below ground level under a lawn, excavations going down 10 ft. The Electrical Equipment Co. (Leicester), Ltd., was responsible for the electrical installation. The accompanying photograph appears by courtesy of the *Leicester Mercury*.



Private air-raid shelter at Leicester, showing the air purifying and electric lighting plant

E.A.W. Housecraft Examinations

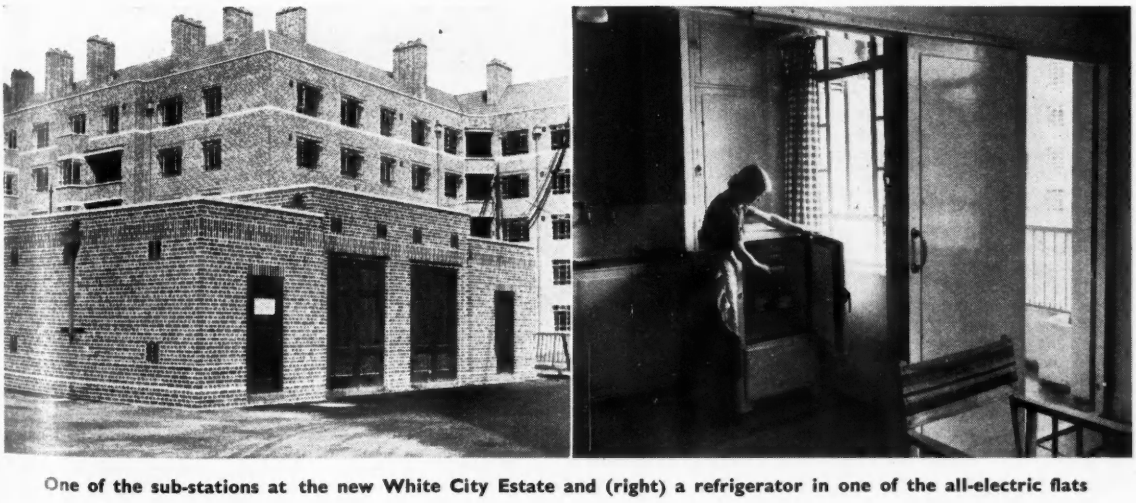
A record number of entries were received for the twelfth E.A.W. certificate examination for demonstrators held on June 15th. Of the 134 candidates who sat for the examination at 17 centres throughout the country, 97 were successful in gaining the certificate, 11 with distinction. This brings the total number of holders of the certificate up to 735. The winter examination will be held on December 7th, and the final date for receiving entries is November 3rd.

"Electrical Review" Index

The index to Vol. CXXIV of the ELECTRICAL REVIEW (January-June, 1939) is now available. Any reader requiring a copy may obtain one free of charge from the Publisher, ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. Cloth binding cases may also be obtained at 3s. 6d. each (3s. 10d., post free).

Street Lanterns on Police Duty

A novel use has been found in Singapore for the blown glass wing directional type of street lighting lantern, introduced by the General Electric Co., Ltd., last year for use in side roads. Six of these have been specially installed so that night watchmen can easily see any unauthorised persons climbing over a fence. The lanterns, equipped with 125-W "Osira" mercury vapour lamps, are installed to illuminate



One of the sub-stations at the new White City Estate and (right) a refrigerator in one of the all-electric flats

the fence surrounding the St. James power station. They are mounted 12 ft. above the ground and spaced at about 160 ft.

British Foundry School

The new session of the British Foundry School will open on September 19th and applications for admission can now be received. Forms can be obtained from the secretary, Central Technical College, Suffolk Street, Birmingham.

Lighting of the New Airways Building

In our description of the electrical equipment of the new Imperial Airways Building on page 98 of our last week's issue, we referred to the indirect lighting of the ground floor booking hall and mezzanine floor by corbel fittings in wood to match

G.V.D. illumination at the new Imperial Airways Building

the panelling. The whole of the installation on this floor was the work of G.V.D. Illuminators, Ltd. As will be seen in the accompanying picture, the light at counter and floor level is perfectly even, glareless and shadowless. Similar G.V.D. wall brackets are used to provide the illumination on the stairways to the basement restaurant and telephone kiosks.

Dutch Safety Regulations

It is announced that the Dutch Government is about to issued new general regulations to control the quality, safety and appropriateness of electrical equipment and plant, to prevent the hiring out of unsuitable apparatus, and to ensure the use of only those installation materials which comply with the standardisation commission's rules.

Iron and Steel Institute

The annual meeting of the Iron and Steel Institute will be held at Cardiff from September 12th to 15th, the programme including visits to the works of Guest, Keen & Nettlefolds, Ltd., and Richard Thomas & Co., Ltd.

S.S. "Andes"

No fewer than 117 electric motors have been supplied by Laurence, Scott & Electromotors, Ltd., for the new S.S. *Andes*. Approximately 100 are required for Thermotank fans, other units being used for Howden forced and induced draught fans, Harland & Wolff fuel oil transfer pumps and a Drysdale bilge pump. Ranging in size from 3 to 105 BHP, they are all of the company's standard marine type, which are characterised by the quiet operation necessary for passenger ship work, especially for ventilating fan drives.

Australian Electrical News

Our Australian correspondent reports that members of the Electrical Trades Union of Western Australia are expressing dissatisfaction because regulations in connection with the Electric Lighting Act of 1937 have not been gazetted, and the following resolution has been passed: "This union emphatically protests against the delay of the Government in introducing regulations for the Electric Lighting Act, amended in 1937, and urges the immediate finalisation of same, in view of the serious electrical accidents which have taken place." The secretary of the union, interviewed, said that during the last twelve months a number of serious electrical accidents had taken place, and to a great extent they were due to faulty installation by amateurs, and lack of supervision by Government inspectors of work done. Licensed electricians were obliged from time to time to work with unlicensed men, and they did not appreciate the risks they were, in consequence, exposed to. The complete enforcement of licensing was an urgent necessity.

A suggestion that Sydney may have a £3,000,000 electricity centre is at present being considered by some of the councillors and senior officers of the Sydney County Council, which is the principal distributor of electricity in Greater Sydney. Several plans have been advanced, but the most ambitious involves the purchase of the Queen Victoria building in the centre of Sydney, and the erection of a massive structure which will provide for the needs not only of the County Council itself, but also the majority of electrical retailers and wholesalers, so that they would all be under one roof. The building would be more than 250 yards long, and the number of storeys would depend upon the number of potential tenants. This plan would cost £3,000,000, including the cost of the land. At the present time the building, which is one of the landmarks of Sydney, is leased to the City Council at a rental of £28,000 a year. Financial experts are going into the economics of the proposed plan, estimating the probable returns and the ability of the Council to repay the cost of the new building and land within thirty years or so—both capital and interest. If this plan is found to be uneconomic, less ambitious suggestions involving an expenditure of about half the amount have been advanced, but they all involve the use of the same site.

Confidence in the future of the Kalgoorlie goldfields is shown by the decision of the Boulder Municipal Council to install a new electric lighting and power plant at a cost of £20,000. The existing gas-engined plant has for some time been working to its full capacity, and in order to meet requirements the municipality has had to draw a considerable amount of electricity from the Kalgoorie Power Corporation. With the installation of a new power plant, Boulder will be independent of all outside resources. New plant will comprise a new power station with an overhead travelling crane, engine room, manager's office, store, meter-testing room and fitting shop. The power units will be four in number, two of 330 HP and two of 165 HP, each being direct coupled to its own generator. A new 11-panel switchboard will be included. The main units will generate DC, but part of the auxiliary equipment comprises two DC motor-alternators which will supply AC to the main Kalgoorie aerodrome. The plant will not be in operation until the end of the year, as all the machinery has to come from England. Engines will be made in Lincoln by Ruston and Hornsby, Ltd., and the generators by the Lancashire Dynamo and Crypto Co., Ltd.

Trade Announcements

The General Electric Co., Ltd., has opened new depôts for the sale of "Osram" lamps at 32a, Newland, Northampton (telephone: Northampton 2958), serving Northampton itself and surrounding towns within a radius of about 20 miles, and at 63, Holdenhurst Road, Bournemouth (telephone: Bournemouth 5763), from which the towns of Bournemouth, Poole and Christchurch with their immediate suburbs will be covered. Mr. K. H. Willcock and Mr. A. H. Plummer will be the respective managers.

Sanderson & Co. (Textile Engineers), Ltd., 5, Cross Street, Manchester, have been appointed sole agents in the North of England to the Myford Engineering Co., Ltd., Beeston, Nottingham, for the distribution of its machine tools to production plants and trade users. The Myford Co., which until recently has specialised in small lathes mainly for the private user, is now marketing a new machine suitable for the engineering and allied trades. This new lathe has 4 in. centres and is 18 in. and 24 in. between the centres, the overall length being 39 in.

Forrest and Webb have moved to 11a, Villa Road, Handsworth, Birmingham. The telephone number is unchanged.

Mr. H. Cedric Neale, for twelve years with his father's firm of H. A. Neale & Co., has started his own electrical engineering and contracting business under the style of H. Cedric Neale & Co. at 303, High Holborn, London, W.C.1.

Guarding Machinery

Under the recent Factories Act it is an offence to sell or let on hire a machine that does not comply with the provisions of Section 13 relating to the guarding of certain parts. This does not, however, as the "Industrial Safety Bulletin" points out, relieve the user of responsibility, as is sometimes supposed. He will be held liable for bringing such a machine on to his premises as well as under Sections 13 to 14 for allowing it to be used. In other words, responsibility for seeing that machinery is adequately guarded still rests with the factory owner.

Annual Holidays

Parmiter, Hope & Sugden, Ltd., are closing their works and offices from August 4th to 14th.

The factory of the Standard Fuse Co. will be closed from August 5th to 14th.

The works and offices of E. N. Bray, Ltd., will be closed for the annual holiday from August 4th to 14th.

Westool, Limited, are closing their works from August 5th to 14th. A limited office staff will be available to deal with urgent correspondence.

Greek Appliance Market

Figures relating to Greek imports of foreign electrical machines and appliances indicate the importance of this market. The development of electricity in Greece during the past ten years has been considerable. Imports of electrical material increased from 63,700,000 drachmas in 1927 to 224,700,000 drachmas in 1937. It is interesting to note that Germany supplies by far the greater part of the Greek market, with 70.3 per cent. of the total for 1937. Great Britain comes next, with 10.6 per cent., and the United States third with 6.6 per cent. German sales to Greece cover nearly every type of material, notably appliances (91,815,000 drachmas) and dynamos (17,153,000 drachmas). American appliance sales totalled 12,469,000 drachmas. The principal item of British manufacture on the Greek market was radio equipment, the value of which was 11,375,000 drachmas in 1937. Next came appli-

ances (7,299,000 drachmas) and telephone and telegraph equipment (3,188,000 drachmas).

Australian Radio Valve Company

The Amalgamated Wireless Valve Co. has decided to begin the production of transmitting valves at its works at Sydney, and it is hoped progressively to develop the industry until Australia produces even the largest of water-cooled transmitting valves. According to *Erda*, Australia is at present dependent on overseas factories for practically all radio transmitting valves. The Commonwealth Government has realised the necessity of making transmitting valves locally and has been anxious that the requirements of the Navy, Army and Air Services and overseas communications channels should be available within Australia.

Works Visit

A party of fifteen representatives of the Portuguese Press visiting this country under the auspices of the British Council were the guests in Liverpool of Automatic Telephone & Electric Co., Ltd., on July 20th and 21st. The party, under the leadership of Senhor Silva Dias and accompanied by Mr. Cosmo Russell of the British Council, Mr. Marcus Cheke, British Press Attaché in Lisbon, and Mr. Gordon Forbes, Secretary of the Anglo-Portuguese Society, flew from London on July 20th. They were met at Liverpool Airport by the Portuguese Consul, Senhor Felix B. M. da Horta, Mr. Arthur H. W. King, C.B.E., British Consul in Lisbon who is temporarily in this country, and representatives of Automatic Telephone & Electric Co., Ltd., including Messrs. T. A. Eades (managing director), A. F. Bennett (manager), and Wrighton (vice-manager). On Friday morning the party visited the Strowger Works, where they were interested to see automatic telephone exchange equipment in course of manufacture for use in their country, the company having now commenced manufacture of equipment under a long-term contract for the Portuguese Government. Before leaving the works each of the visitors was presented with a novel souvenir in the form of an electric clock attractively mounted in a Strowger automatic telephone dial on an ebony base. The party left the works for the Town Hall where, together with the directors of the company, they were entertained by the Lord Mayor of Liverpool at a civic luncheon.

Thos. Firth and John Brown, Ltd., have sent us a copy of a souvenir brochure issued on the occasion of the visit to their Atlas and Norfolk works of the Forfeit Feast Guests of the Master and Mistress Cutler.

Stepney's New Electricity Showrooms

Stepney Borough Council Electricity Committee has approved an estimate of £134,190 for the erection of offices and showrooms.

Wharf-lift Installation

Bull Motors inform us that the variable-voltage motor-generator set included in the lift installation described in a recent issue was of their "Super-Silent" type.

An Exhibition of Wood Products

An exhibition of wood products being held this week at the Dean Hotel, W.1, by Mallinson & Eckersley, Ltd., includes a number of attractive new types of turned standard and table lamps, as well as examples of wooden screen fires in various designs. The outstanding advantage of the latter, particularly the models made of plywood, is of course their extreme lightness, with consequent ease of portability. In these fires the most recent development is the use of "Layerware" (designs built up by successive layers of different coloured wood), for decoration purposes.

Distribution Boards

A revised edition of the British Standard Specification for Distribution Boards has been issued. It covers a considerably wider field than the 1929 edition, since it includes phase-splitting distribution boards, circuit-breaker distribution boards and switch and fuse distribution boards. It also covers boards up to 100 A per outgoing circuit at not more than 250 V to earth. Metal cased boards, whether cast or fabricated, are specified in detail and weatherproof requirements are given. Wood-cased boards and boards with glass fronts are also included with minimum dimensions of wood and weights of glass required to provide adequate mechanical strength. Cases of insulating material are also, for the first time, recognised as standard, and tests for the degree of inflammability are referred to. Copies of this revised Standard (No. 214-1939) may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1 (2s. 2d. post free).

South African Broadcasting Station

Marconi's Wireless Telegraph Co., Ltd., has received an order from the South African Broadcasting Corporation for the supply of a short wave broadcasting transmitter.

Anti-dazzle Motor Car Lamps

An interesting brochure has been published by Notek Electric Co., Ltd., 230-240, Brixton Road, London, S.W.9, which describes the benefits of the "Notek" anti-dazzle lamp and includes a report by the chief engineer, of the mechanical transport department of Unilever, Ltd. A specially designed instrument is being used by the company to ensure precise positioning of headlamp bulb filaments in relation to headlamp reflectors. The machine, through which every bulb must pass, tests measurements through the whole of the optical axis and by throwing an enlarged picture of the filament on a screen enables both the focal distance and axial displacement to be checked with fine accuracy. The machine rejects all lamps outside the company's limit of half a millimetre.

Power Station Visit

Members of the Torquay Town Council were entertained to lunch on July 20th at the Seymour Hotel, Totnes, where they paid their first official visit to the Corporation's power station at Newton Abbot. In the course of a speech Mr. Frank Callard, chairman of the Electricity Committee, said it was likely that certain schemes would be put forward in the future, and it was thought that members of the Corporation should have an opportunity of seeing the undertaking as it was to-day, so that they could use their judgment on the propositions which would be made at an early date. It had been essential to raise the price for electricity, but consumers had the certainty that the undertaking was so organised that they could have reliability, which was a most important consideration.

The Mayor, Mr. Charles G. Price, said that it had taken a great deal to bring the electricity undertaking to the position it now occupied, and credit had to be given to Mr. Callard and the borough electrical engineer and manager, Mr. G. J. Hollyer.

When the members inspected the power station they were conducted over the works by Mr. Hollyer, Mr. G. B. Dent, the resident engineer, and Mr. A. J. R. Willingham, the testing engineer. Capital expenditure on the undertaking, which supplies direct or in bulk 455 sq. miles of South and Mid Devon, amounted to £1,476,796 at March, 1938. The length of overhead lines totals 220 miles and there are 40 miles of underground cables. The number of meters on consumers' premises exceeds 21,000.

Rubber Producing Companies

The 1939 edition of "Rubber Producing Companies" is now obtainable from the *Financial Times*, 72, Coleman Street, E.C.2, and the Mincing Lane Tea & Rubber Share Brokers' Association, Plantation House, E.C.3 (price 7s. 6d.).

Wages in the Cable-making Industry

The Joint Industrial Council for the Electrical Cable-making Industry announces that the July 1st cost-of-living figure (56 per cent. about the 1914 level) will not involve any alteration in wages on the third pay-day in August.

Change of Telephone Number

The telephone number of the Institution of Chemical Engineers and the Diesel Engine Users' Association has been changed to Victoria 6161-2.

Prices of Materials

Henry Gardner & Co., Ltd., report, July 26th: Copper bars (best selected), sheet and rod, no change. English pig lead, £16 15s., 5s. decrease. Spelter, no change. English block tin, no change. Mercury, no change.

Edward Till & Co. report, July 26th: India-rubber, Para fine, 7½d., ½d. increase.

New Catalogues and Lists

Key Engineering Co., Ltd., 4, Queen Victoria Street, London, E.C.4.—Details of the "Key" fibre underfloor duct system.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Leaflets relating to "Osram" torch and radio panel bulbs.

Myford Engineering Co., Ltd., Beeston, Nottingham.—A folder describing a new 4-in. centre lathe for toolrooms.

Herbert Morris, Ltd., Loughborough.—Details of new joist piling slings.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, London, E.C.1.—A folder describing v.i.r. cables and wiring systems.

Allen West & Co., Ltd., Brighton.—A leaflet relating to type "SCF" direct switching contactor starters.

Switchgear & Cowans, Ltd., Elsinore Road, Old Trafford, Manchester, 16.—Booklets dealing with type "A" circuit-breakers and cubicle type switchgear.

Bowthorpe Electric Co., Ltd., Goodtric Works, Purley Way, Croydon.—Leaflets on wire rope clips and span tension joints.

J. H. Sankey & Son, Ltd., Ilford.—A 30-page catalogue of refractories, including much useful technical data.

The Gramophone Co., Ltd., 98-108, Clerkenwell Road, London, E.C.1.—A new art catalogue of television receivers.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

MIRRO berth lamp.

ELECTRICITY SUPPLY

Progress at Barnstaple. New Hams Hall Chimney. Switchgear Modernisation at Ilford. Differences in the Isle of Man. Jarrow Street Lighting

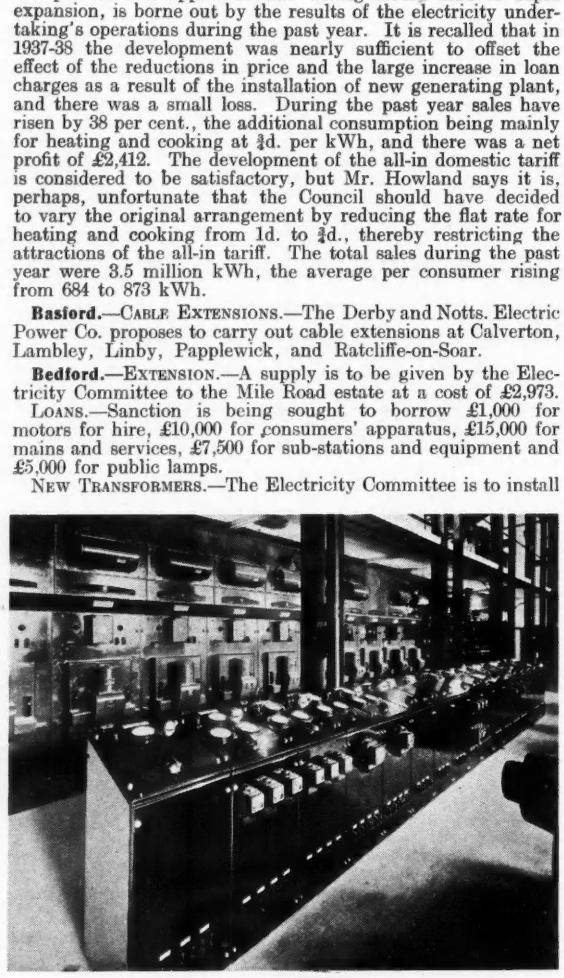
Barnstaple.—TARIFFS AND DEVELOPMENT.—The view expressed by Mr. F. W. S. Howland, borough accountant, that price reductions allied with adequate facilities for the hire and hire-purchase of apparatus and wiring would lead to rapid expansion, is borne out by the results of the electricity undertaking's operations during the past year. It is recalled that in 1937-38 the development was nearly sufficient to offset the effect of the reductions in price and the large increase in loan charges as a result of the installation of new generating plant, and there was a small loss. During the past year sales have risen by 38 per cent., the additional consumption being mainly for heating and cooking at ¾d. per kWh, and there was a net profit of £2,412. The development of the all-in domestic tariff is considered to be satisfactory, but Mr. Howland says it is, perhaps, unfortunate that the Council should have decided to vary the original arrangement by reducing the flat rate for heating and cooking from 1d. to ¾d., thereby restricting the attractions of the all-in tariff. The total sales during the past year were 3.5 million kWh, the average per consumer rising from 684 to 873 kWh.

Basford.—CABLE EXTENSIONS.—The Derby and Notts. Electric Power Co. proposes to carry out cable extensions at Calverton, Lambley, Linby, Papplewick, and Ratcliffe-on-Soar.

Bedford.—EXTENSION.—A supply is to be given by the Electricity Committee to the Mile Road estate at a cost of £2,973.

LOANS.—Sanction is being sought to borrow £1,000 for motors for hire, £10,000 for consumers' apparatus, £15,000 for mains and services, £7,500 for sub-stations and equipment and £5,000 for public lamps.

NEW TRANSFORMERS.—The Electricity Committee is to install



New 6.6 kV switchboard, Uphall Road, Ilford

Scott-connected transformers in a sub-station to be erected at Kempston at a cost of £21,295.

Bedlington.—IMPROVED LIGHTING.—The Urban District Council has decided to apply for sanction to borrow £6,200 for improving the lighting system throughout the area.

Bexhill.—INCREASED CHARGES.—The Electricity Committee recommends increases in charges of ¼d. per kWh.

Birmingham.—ENGLAND'S TALLEST CHIMNEY.—An order has been placed with P. C. Richardson & Co., Ltd., by the Electric Supply Department for what is stated to be the tallest brick chimney in this country. It is to serve the new Hams Hall power station and will be 400 ft. high with foundations 27 ft. below the ground. The internal diameter will be 22 ft. at the top and about 2,000,000 bricks and 400 tons of terra cotta capping will be required. An electric lift will be built within the chimney for the conveyance of workmen.

SUB-STATION.—A sub-station is to be built at Pembroke Croft, Hall Green.

Brighton.—HIGH-VOLTAGE CABLE.—The Electricity Committee has approved plans for the laying of an 11,000-V cable from Hangleton kiosk at the junction of Hangleton Road and Old Shoreham Road to the sub-station site in West Way, Hove, at an estimated cost of £2,200.

STREET LIGHTING AT TELSCOMBE.—The Brighton Corporation has approved the Parish Council's plan for the installation of electric street lamps at Telscombe.

Bromsgrove.—UNDERGROUND CABLES.—The S.W. & S. Electric Power Co. is to construct underground cables at Hagley, &c., and overhead lines at Gorsey Lane, Alvechurch.

Burnley.—NEW SWITCHGEAR.—The Electricity Department has put into commission new switchgear in Bacup Road to meet the increased demand for electricity to Mereclough, Park Pit and the Enfield Brick and Lime Company's works.

Chester.—ELECTRICAL DEVELOPMENT.—Expenditure of £13,587 on electricity schemes is proposed by the City Council and the city electrical engineer is to be instructed to arrange for the following schemes: sub-station at Pearl Lane, £1,895; kiosk and transformer at Whipcord Lane, £770; kiosk at Pipers' Ash and high-voltage cables to Mannings Lane, £2,173; kiosk at Vicar's Cross, £815; sub-station at Heath Lane, £1,605; an additional high-voltage cable from the lead works sub-station to Pearl Lane with the necessary switchgear, £1,329; unspecified sub-stations, £5,000.

Croydon.—LOANS.—The Electricity Committee is seeking sanction to borrow £10,000 for sub-station equipment and £327,712 for power station plant.

THERMAL STORAGE HEATING.—Negotiations have taken place for the provision of central heating at 24 flats at Lansdowne Court by means of electric thermal storage. It is proposed that the Corporation shall provide an installation of 84 hot water radiators and pipework in the various rooms, together with electric heating plant and a 4,000-gal. storage tank at a cost of £1,000, of which part would be recoverable. The owners are prepared to enter into an agreement to hire the complete installation at a rental of £70 per annum for a minimum period of 14 years, and, in the event of the property being sold, to purchase the installation for the sum of £1,000 less the value of rentals paid up to the time of purchase. They are also to provide the necessary building for housing the heating plant.

Cupar.—ELECTRIC STREET LIGHTING.—Despite the fact that the introduction of electric street lighting in Strathmiglo will cost the ratepayers 8¾d. in the pound, which is 2¾d. more than the cost of the present gas lighting, the Cupar Council has decided to proceed with the scheme.

Harwich.—LOAN.—Sanction is being sought by the Town Council to a loan of £6,993 for mains, plant, and buildings.

Ilford.—DISTRIBUTION IMPROVEMENTS.—Details of the recent modernisation of the Ilford electricity supply distribution have been supplied by Mr. G. F. Gregory, the engineer and manager to the Electricity Department. At Ilford the two large sub-stations in Uphall Road and Grove Road have been completely re-equipped. Following the practice adopted at the main distribution station at Ley Street in 1937, truck-type switchgear has been installed, and in the case of Uphall Road sub-station duplicate busbars have been fitted with off-load selector isolating switches.

The switchgear has a proved rupturing capacity of 250,000 kVA at 6.6 kV, and additional tests at 6.6 kV and 11 kV were taken in conformity with B.S.S. 116/1937 and to confirm the results of the previous tests. The behaviour of the switch indicated that there was an ample factor of safety at the rated capacity. Special attention was paid in designing the truck unit to ensure adequate thermal capacity with the short-circuit rating, and ability to withstand short-circuit stress under all conditions of fault operation. In each case, following modern practice for this rating, the oil switches are remotely operated, being fitted with solenoid closing gear actuated from a desk-type control board mounted at a reasonable distance from the main switchboard.

The Uphall Road switchboard consists of 17 units comprising eight feeders, four machine units, one lighting unit, two busbar section units, and two busbar coupler units. Busbar coupler switches are inserted in between the trunking connections linking the two sections of the switchboard. The Grove Road sub-station switchboard consists of 14 units comprising eight feeder units, four machine units, one bus section switch, and one public lighting unit. In this instance the control board, which is of the same type as that at Uphall Road, is mounted at the opposite side of the sub-station. The whole of the installation was supplied to the specification of Mr. G. F. Gregory by Crompton Parkinson, Ltd., of Chelmsford, who carried out the installation work.

Isle of Man.—BOARD APPLIES FOR OWN STATION.—As we reported last week, the Isle of Man Electricity Board is contemplating the erection of a generating station. This is the outcome of a dispute which the Board has had with the Douglas Corporation over the price charged for electricity. In its report for the year 1938-39, the Board states that it is now obvious that a considerable saving would accrue if the supply were generated by the Board instead of being purchased from the Douglas Corporation.

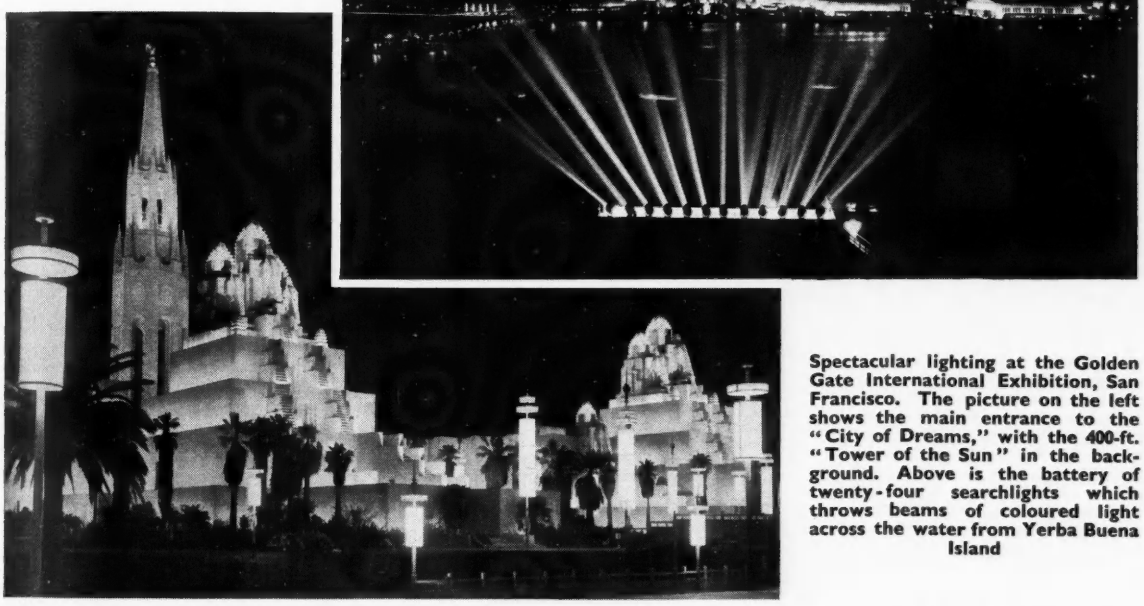
This year the Board estimates the average cost per kWh at 0.809d., compared with the corrected figure of 0.782d. for last year. The Board reports that it has been unsuccessful in its efforts to arrange for a tariff reduction.

Two methods considered by the Board for producing its own supply were water-power and Diesel plant. The Board is of opinion that water-power would entail very heavy capital expenditure, and the most economical output that could be

obtained from the Sulby river would be approximately 2,000,000 kWh per annum, at a cost of approximately 0.4d. per kWh. Sales by the Board last year totalled 3,395,913 kWh, an increase on the year of 527,726 kWh. While water-power would be of value as an additional supply, the report states, and the question of installing it could be left till later, the primary supply should be by Diesel plant.

Jarrow-on-Tyne.—STREET LIGHTING.—The Town Council has decided to enter into an agreement with the North-Eastern Electric Supply Co., Ltd., for the lighting by electricity of Grange Road, Grange Road West, Ellison Street, Western Road, Market Square, and Walter Street. The borough engineer is to report on plans for the lighting of another thirteen streets by electricity. A section of Leam Lane is to be lighted by electricity at a cost of £400 per annum, and seven streets on the Corporation housing estate are also to be illuminated by electricity.

Leigh.—REDUCED POWER CONSUMPTION.—A fall in the demand for power supplies, to which the closing down of a section of a large industrial establishment contributed, was responsible for a reduction in the sales of the Electricity Department from 19.0 million to 18.1 million kWh during the past year. All other types of business improved, particularly supplies under the all-in tariffs, which increased by 16 per cent. Mr. J. B. Hudson, the borough electrical engineer, remarks that the results achieved by the showrooms and installation section of the undertaking continue to be extremely gratifying. There was a net profit of £6,066 on the year's trading.



Spectacular lighting at the Golden Gate International Exhibition, San Francisco. The picture on the left shows the main entrance to the "City of Dreams," with the 400-ft. "Tower of the Sun" in the background. Above is the battery of twenty-four searchlights which throws beams of coloured light across the water from Yerba Buena Island

London.—FULHAM.—A recommendation that application should be made for a loan of £175,973 for gas-washing plant at the generating station has been passed by the Electricity Committee.

ELECTRICITY FOR SCHOOLS.—The London County Council Education Committee is to install electricity at Grove Vale school, Dulwich, and New Park Road school, Clapham.

Manchester.—POWER STATION EXTENSION.—The Electricity Committee is to extend the Stuart Street power station at a cost of £892,420. The Droylsden transformer station is also to be enlarged at a cost of £4,150. The extension scheme will comprise two 30,000-kW turbo-generators and one 1,500-kW generator, £236,700; boiler plant, £258,500; steel chimney, £17,500; pipework, £31,500; coal plant, £15,300; circulating water pumps, £56,900; switchgear, £26,000; reactor, £18,000; switch panels, £52,000; transformers, £119,520, and buildings, £60,500.

Oswestry.—SUPPLY EXTENSIONS.—The Town Council has agreed to give a supply of electricity to the Rural District Council's pumping plant at Mardy, and it is also proposed to extend the supply to the nearby village of Selattyn.

Preston.—CULVERTS FOR POWER STATION.—The Ribble Authority at Preston has approved proposals of the Central Electricity Board for the construction of culverts beneath the River Ribble and through the dock estate to convey water for condenser purposes in the event of an enlargement being made to the Ribble power station.

CABLES.—The Electricity Committee is inviting tenders for the supply and erection of overhead and underground cables in connection with the extension of the Fylde Coast supply.

Rawtenstall.—ANNUAL ACCOUNTS.—The accounts of the Electricity Department for the past year show that there was a profit of £4,074 compared with £2,846 in the previous year. The Department sold 22.6 million kWh (7 per cent. increase), the number of consumers rising from 7,599 to 7,988. A sum of £1,000 is contributed to the rates.

Sheffield.—NEW SUB-STATIONS.—The Electricity Committee is to erect sub-stations at Saxon Road, Ferrars Road, and Broom Street, and plans have been approved for a sub-station in Rockingham Street, for Gladwins, Ltd.

Sleaford.—CHANGE-OVER.—Sanction is being sought by the Urban District Council to borrow £1,885 for the change-over of the supply in the Drove Area.

Sunderland—ANNUAL REPORT.—The general manager's annual report of the year's working of the electricity undertaking for the year ended March 31st last shows a total revenue for the tramways of £163,757 (as compared with £163,944 in 1938), and working expenses, £131,506 (£116,345), leaving a balance of £21,342 (£36,686). The number of passengers carried increased by 4.8 per cent. over last year to 48,161,995.

Swansea.—TRANSFORMER.—The Electricity Committee is to install an additional 12,500-kVA transformer at a cost of £5,940.

Tynemouth.—SUPPLY TO SAWMILLS.—The Electricity Committee has arranged to provide a supply at a cost of £800 to the Albert Edward Dock Saw Mills Co. at Northumberland.

Weymouth.—INCOME-TAX REFUND.—The borough treasurer recently reported to the Electricity Committee that the claim for an income-tax refund on the wear and tear allowance for machinery had been settled, the Inspector of Taxes having agreed to refund £1,320 for the four years in question.

Overseas

Egypt.—MODERN STREET LIGHTING.—An interesting example of modern street lighting has recently been provided in an important thoroughfare in Egypt. This is the section of the Corniche, a particularly fine road which runs from Alexandria to Glymenopoulo. The lighting, which extends over nearly ten miles, was carried out by the Tractor and Engineering Co., Ltd., of Cairo. It is by 500-W "Osram" lamps in a special type of large G.E.C. "Oxford" lantern. One modification is the provision of copper outer reflectors, this metal being highly resistant to corrosion, which easily occurs on this coast. Nearly 300 lanterns are installed, mounted at a height of 26 ft. The columns are of steel and have a pleasing original bracket design.

Ceylon.—HYDRO-ELECTRIC PROJECT.—According to the Colombo correspondent of *The Times* the State Council has passed a vote of Rs.14,500,000 for the Government's hydro-electric scheme. The contractors may import materials duty free.

Eire.—LIGHTING IN DUBLIN.—It was recently reported to the General Purposes Committee of Dublin Corporation that the conversion of the street lighting from gas to electricity, under an agreement with the Electricity Supply Board, will mean a saving of £8,000 a year.

France.—PRODUCTION OF ELECTRICITY.—The production of electricity in France during May by the 114 largest producing and distributing companies amounted to 1,366,100,000 kWh, compared with 1,197,700,000 kWh in May, 1938, representing—with the same number of working days—an increase of 14.6 per cent., the biggest monthly increase since the beginning of the year, says *Reuter's Trade Service* from Paris. Out of this production thermal supplies only accounted for 331,700,000 kWh, compared with 437,700,000 kWh for May, 1938, a fall of 24.21 per cent. The water-power production, on the other hand, rose from 760,000,000 kWh to 1,034,000,000 kWh, an increase of 36.1 per cent. The production by the 114 companies during the first five months of the year totalled 6,755,100,000 kWh, against 6,114,200,000 kWh for the corresponding period of last year, an increase of 10.48 per cent.

Germany.—WATER-POWER SCHEME.—In a recent issue of the *Siemens Review* H. Pussel and K. Pester (Siemens-Schuckert) gave a description of a hydro-electric installation recently completed on the lower reaches of the River Bober, in the province of Brandenburg. It comprises two generating stations; in the main one at Deichow there are three 25,000-kW Kaplan-type turbines and generators working under a head of about 98 ft., and the second at Crossen consists of two 2,000-HP Kaplan turbines running at 115 RPM under a head of 15 ft. 8 in.

Holland.—UNDERGROUND POWER TRANSMISSION SYSTEM.—A 150-kV transmission system between Rotterdam and The Hague has recently been completed. It is about 13¾ miles in length and comprises four 150-kV single-phase cables having a section of 240 sq. mm. and a central pressure oil-filled passage. The cables, one of which is being used as a standby, have been designed for the transmission of power to the extent of 200 million kWh per annum. They are laid in cement-covered trenches and except at certain crossings are unarmoured.

Morrocco.—ELECTRICAL PROGRESS.—In opening the session of the Council of Government at Casablanca, Resident-General Nogues stressed the development of electricity in Morocco. Figures so far collected this year indicate an improvement of 12 per cent. over the consumption of electricity last year. The situation renders the work now projected and under way for the construction of new hydro-electric plants more urgent than ever before. This is particularly true of the work on the Oum er Rebbia river, where the road which is to provide access to the scene of the work is practically completed. Plans are also ready for the construction of a power plant on the Moulouya river, and are only awaiting the approval of the authorities of Spanish Morocco for work to be started. At N'Fis, on the Morocco plain, the dam is now full and is retaining its capacity of 50 million cubic metres of water for hydro-electric power production. Work on hydro-electric plants is also proceeding satisfactorily in the Tafilalet region, in the Gheris region, and in the Ziz valley.

Switzerland.—HYDRO-ELECTRIC POWER STATION.—In a recent issue of the *Schweizerische Bauzeitung* some particulars were given of a new hydro-electric power station which is at present in course of construction on the Rhine between Eglisau and the outlet of the River Aar. The plant will comprise two 24,000-HP Kaplan vertical-shaft turbines and generators designed to work under a head of about 39 ft. The new station is expected to be ready for operation during 1941.

Turkey.—ELECTRIFICATION WORK.—The Ministry of Public Works at Ankara has approved a plan for the construction of a hydro-electric works at Mugla, in the south-west of Anatolia, learns *Reuter's Trade Service* for foreign papers. Tenders for the work will be invited very shortly. At the same time, the Ministry has approved plans for six other smaller power stations, the construction of which will be started this year. These stations will supply the communes of Kulluk, Marmaris, Ula, Koycegiz, Dacya, and Fethiye, all places in the south-west of Anatolia. The municipality of Rize, situated on the Black Sea to the west of Trebizonde, has started the construction of a new power station, and the municipality of Istambul is studying a plan for erecting an electric power station at Catalca.

TRACTION

Brighton.—ALL TRAMS TO GO.—The Corporation reports that the tramway services will be completely discontinued in August, and is arranging to proceed with the removal of the tram tracks and the reconstruction of the roads at a cost of £75,000.

Germany.—TROLLEY-BUS DEVELOPMENTS.—In a recent issue of the *E.T.Z.* it is stated that at the end of February last there were thirty-four trolley-buses in operation in Germany working over a total distance of about 42 miles. At the date mentioned another 42½ miles of trolley-bus lines were in course of construction in the country, for which an additional seventy vehicles had been ordered.

Italy.—ELECTRIC TRAIN'S HIGH SPEED.—In its final trials a new electric train, which is to go into regular service shortly, covered a distance of 198 miles between Milan and Florence in two hours—an average speed of 99 m.p.h. It is expected that within a year the whole distance of 529 miles between Milan and Naples will be covered in six hours—an average speed of 88 m.p.h. The fastest trains now do the run in eight hours. *Reuter* (Rome).

RAILWAY ELECTRIFICATION.—Figures supplied to the Italian Parliament by the Ministry of Communications indicate that electricity has already become the most important means of transport on the Italian railways, 43 per cent. of the total number of train miles being accomplished by electric trains, while only 40 per cent. were covered by steam-drawn trains. The remaining 17 per cent. were run by auto-rail cars and motor coaches with petrol or heavy-oil motors. It is estimated that the electrification work permitted a saving of 1,501,000 tons of coal during 1938 alone. During the course of 1939 the electrified network is to be still further extended by putting into service the important international line from Ventimiglia and Modane to Rome, 307.5 km. of this line being included in the section to be opened for service, and representing an estimated saving of coal of 388,000 tons per year.

Nottingham.—EXTENSION OF TIME.—The Minister of Transport has extended until January 12th, 1940, the time by which the Corporation may commence to use trolley-buses along the route specified by Section 3 of the Nottingham Corporation (Trolley Vehicles) Order, 1934.

Russia.—RAILWAY ELECTRIFICATION.—Towards the end of this year the section of the Kirov Railway (in the Kola Peninsula) from Apatiti Station to Murmansk, a distance of 160 km., will have been fully electrified.—*Bulletin* of the Russo-British Chamber of Commerce.

South Africa.—TROLLEY-BUSES FOR JOHANNESBURG.—*Reuter* reports from Johannesburg that orders totalling £166,382 for 55 trolley-buses to be supplied by British firms are recommended by the general manager of the Transport Department.

South Shields.—TROLLEY-BUS EXTENSION.—The Transport Department is to extend the trolley-bus service from Redwell Lane to Marsden Grotto.

COMMUNICATIONS

France.—TELEVISION.—Further development of French television services is foreshadowed by the action of the Chamber Finance Committee in approving a proposal to vote another 1,000,000 francs (about £50,000) states *Reuter* from Paris.

Great Britain.—HULL TELEPHONES.—The Telephones Committee reports a net profit for 1938-39 of £26,796. The royalty tax paid amounts to £15,119, making a total from the commencement of the service of £280,387. The number of new subscribers connected to the system during the past year was much greater than in any previous year since the commencement of the service, due to the new tariff introduced in July for two-party line subscribers at 52s. per annum, payable quarterly, including 200 outward local calls.

TELEPHONE BETWEEN BARRA AND UIST.—The first calls were made recently upon the telephone service connecting Barra and South Uist with the mainland. The new system, which embraces ultra-short-wave radio beams to cross the Sound of Mull and the Minch, does not yet cover the north end of South Uist, but it is hoped that the scheme will be completed before the end of the present year. Mr. R. Teasdale, telephone manager of the Scotland West Area, presided at the opening ceremony in Glasgow.

India.—TELEPHONE PROGRESS.—Bombay's trunk telephone exchange is to be extended to meet the increased use being made of the trunk telephone. A new three-channel cable to Ahmedabad and a single-channel cable to Karachi are to be installed to cope with the number of calls being booked daily between Bombay and Ahmedabad.

BRITISH AIR MINISTRY HELPS TOWARDS INDIAN STATION.—*Reuter* reports from Simla that the British Air Ministry has paid the cost of erecting a permanent aeronautical wireless station at Gwalior, an important landing place on the sea-plane route across India. The new station will cost over £15,000 excluding the buildings, which are being supplied by Gwalior State.

Italy.—ROME TELEVISION BEGUN.—The first public demonstration of television in Italy was given in Rome on Saturday last, July 22nd. The transmitting station on the Monte Mario, on the outskirts of Rome, came into operation and the radius of reception was about 30 miles.

Sweden.—NEW TELEPHONE CABLES.—The Swedish Post Office recently commenced work on three new telephone cables between Göteborg and Malmö *via* Helsingborg. One is of the carrier wave type, which is thus introduced in Sweden for the first time.

POLICE RADIO.—A new ultra-short-wave transmitter has been installed in the headquarters of the Stockholm Police Department, marking the introduction of police radio in the Swedish capital. Operating on 9.4 metres, the transmitter radiates messages to patrol cars and also to suburban police stations where special receivers are installed.

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

Hivac, Ltd.—Private company. Registered July 21st. Capital, £100. Objects: To carry on the business of manufacturers and sellers of drawn wire vacuum and gas-filled incandescent lamps, carbon-filament lamps, hard and soft thermionic valves adapted to function as detectors, amplifiers or generators of electrical oscillations, &c. The subscribers are: A. V. Tyrer, 8, Rosebery Avenue, Waterloo, Liverpool, 22; and A. N. Denaro, 4, Kingsdale Road, Liverpool. Solicitors: Hill, Dickinson & Co., 10, Water Street, Liverpool, 2, and Cunard House, 88, Leadenhall Street, London, E.C.3.

Premier Electric Co. (Manchester), Ltd.—Private company. Registered July 21st. Capital, £250. Objects: To carry on the business of electrical engineers and contractors, manufacturers of and dealers in electrical and mechanical apparatus, and in particular wireless sets, valves, gramophones, &c. The subscribers are: C. Glickman and Mrs. F. Glickman, both of 10, Woodhill Grove, Prestwich, Manchester; and J. Kavarsky, 24, Willingdon Drive, Prestwich, Manchester. C. Glickman is the first director. Registered office: 221, Bury New Road, Manchester.

H. M. Horton, Ltd.—Private company. Registered July 21st. Capital, £100. Objects: To carry on the business of contractors for the erection, installation, hire, maintenance and operation of electrical plant, machinery, fittings, lighting and power equipment, etc. The directors are: H. M. Horton, 103, Rivermeads Avenue, Hanworth, Feltham, Middx; and T. F. T. Silva, 49a, Hampton Road, Teddington. Registered office: Dorland House, 14/16, Regent Street, S.W.1.

Shannons' Radio, Ltd.—Private company. Registered July 22nd. Capital, £2,000. Objects: To carry on the business of buyers, sellers and manufacturers, importers, exporters, distributors and repairers of radio, television, electrical, scientific and telephone apparatus, &c. The subscribers are: W. H. Shannon and L. H. Shannon, both of 1, Chetwynd Avenue, Urmston, Lancs. W. H. Shannon shall be permanent governing director so long as he holds one-third of the issued ordinary share capital. Registered office: 25, Station Road, Urmston, Manchester.

C. Koenig & Co., Ltd.—Private company. Registered July 22nd. Capital, £1,000. Objects: To carry on the business of manufacturers and factors of, agents for and dealers in lighting and heating equipment, including electrical and all kinds of glassware and hardware, &c. The subscribers are: M. J. Koenig, 23, Hillcrest Road, Purley, Surrey; and J. Carlo, 27, New Cross Road, S.E.14. Secretary: D. MacLean. Registered office: 21, Ropemaker Street, E.C.2.

R. C. Bryant & Co. (Engineers), Ltd.—Private company. Registered July 18th. Capital, £1,000. Objects: To carry out contracts entered into by R. C. W. Bryant; to carry on business as industrial meter lead insulators, suppliers of meter automatic combustion controls, factors for the sale and purchase of every description of tubes and fittings, electrical apparatus, switchgear, cables, &c. The directors are: R. C. W. Bryant, "Highfield," Denham Lane, Chalfont St. Peter, Bucks (permanent governing director and chairman); and A. G. Angell, 311, Hasluck's Green Road, Shirley, Birmingham. Registered office: 211, Lower Addiscombe Road, Croydon, Surrey.

Loblite, Ltd.—Private company. Registered July 18th. Capital, £3,000. Objects: To carry on the business of electrical, mechanical and general engineers, manufacturers of and dealers in bakelite, erinoid, celluloid, rubber, &c. Directors: F. S. Loebl and R. Loebl, both of 38, Fitzjohns Avenue, N.W.3; Sir R. W. L. Dunlop, Sandleford Grove, Newbury, Berks; and A. van Santen, address not stated. Solicitors: Child & Prescott, 4, Serjeants Inn, E.C.

Nitron Lamps, Ltd.—Private company. Registered July 19th. Capital, £500. Objects: To carry on the business of manufacturers and repairers of and dealers in electric, gas and oil lamps, quartz lamps, reflectors, artificial lighting apparatus, bells, fires, stoves, cookers, &c. Permanent directors: W. Littleton, 52, Archfield Road, Cotham, Bristol; and E. A. Banks (managing director), The Grange, Cleeve, Somerset.

Gaedor, Ltd.—Private company. Registered July 19th. Capital, £100. Objects: To carry on the business of makers of and dealers in electrical or chemical appliances and goods of all kinds, &c. Directors: H. Vane Schofield, Carisbrooke House, The Avenue, Cheam; H. L. Hill, Wall-croft, Colcokes Road, Banstead, Surrey; and W. H. Denby, 5, Bishops Road, Hove. Secretary: F. Anderson. Registered office: 376, Deansgate, Knott Mill, Manchester.

Evans Electroselenium, Ltd.—Private company. Registered July 20th. Capital, £2,000. Objects: To carry on the business of manufacturers of and dealers in selenium photo elements and rectifier plates and electrical, photographic and scientific apparatus and materials, including apparatus for wireless, telegraphy, television and cinematography, &c. Subscribers: S. G. Kitchen and J. N. Nisner, both of 22, Aldermanbury, E.C.2. Solicitors: Biddle & Co., 22, Aldermanbury, E.C.2.

Universal Cooler, Ltd.—Private company. Registered July 20th. Capital, £5,000. Objects: To acquire the business of refrigeration and cold storage manufacturer, engineer and repairer carried on by Edwin M. L. Powell as "Universal Refrigeration Services" at 91, Charterhouse Street, E.C.1. Permanent directors: E. M. L. Powell, 24, Raleigh Drive, Tolworth, Surbiton; and J. Durrant, 6, Watford Way, Hendon, N.W.4. Registered office: 91, Charterhouse Street, E.C.1.

Cinema Electric Commodities, Ltd.—Private company. Registered July 19th. Capital, £10,000. Objects: To carry on the business of manufacturers, exporters and importers of and dealers in all kinds of electrical and mechanical machinery, plant and apparatus, manufacturers of and dealers in all kinds of cinematograph lanterns, apparatus and equipment, &c. Directors: Vernon Blanchard, 6, Broadwater Road, Worthing; and L. J. Oderbolz, 13, Forest Drive West, Leytonstone, E.11. Registered office: 6, Serjeant's Inn, Fleet Street, E.C.4.

Companies' Returns

Statements of Capital

China and Japan Telephone and Electric Co., Ltd.—Capital, £200,000 in £1 shares. Return dated May 2nd. 150,000 shares taken up. £60,239 paid. £89,761 considered as paid. Mortgages and charges, nil.

Alert Electrical Co., Ltd.—Capital, £2,000 in £1 shares. Return dated May 4th. 711 shares taken up. £711 paid. Mortgages and charges, nil.

Kelvinator, Ltd.—Capital, £65,000 in 40,000 preference shares of £1 and 500,000 ordinary shares of 1s. Return dated May 12th. All shares taken up. £65,000 paid. Mortgages and charges, nil.

West Devon Electric Supply Co., Ltd.—Capital, £450,000 in 100,000 preference and 350,000 ordinary shares of £1. Return dated May 16th. All shares taken up. £386,513 paid on 88,000 preference and 298,513 ordinary shares. £63,487 considered as paid on the remainder. Mortgages and charges, nil.

London Electric Wire Company and Smiths, Ltd.—Capital, £1,250,000 in 750,000 ordinary and 500,000 preference shares of £1. Return dated May 18th. 684,070 ordinary and 400,000 preference shares taken up. £350,035 paid on 35 ordinary and 350,000 preference shares. £734,035 considered as paid on 684,035 ordinary and 50,000 preference shares. Mortgages and charges, nil.

Cuba Submarine Telegraph Co., Ltd.—Capital, £220,000 in £10 shares (16,000 ordinary and 6,000 preference). Return dated May 22nd, 1939. All shares taken up. £220,000 paid. Mortgages and charges, nil.

Cable & Wireless, Ltd.—Capital, £30,000,000 in £1 shares. Return dated May 22nd, 1939. All shares taken up. £1,266,493 paid. £28,733,507 considered as paid. Mortgages and charges, nil.

Mid-Cumberland Electricity Co., Ltd.—Capital, £350,000 in £1 shares. Return dated May 22nd, 1939. 343,500 shares taken up. £338,269 paid. £5,231 considered as paid. Mortgages and charges, nil.

Eastern and South African Telegraph Co., Ltd.—Capital, £600,000 in £10 shares. Return dated May 23rd, 1939. All shares taken up. £600,000 paid. Mortgages and charges, nil.

Eastern Extension, Australasia and China Telegraph Co., Ltd.—Capital, £4,000,000 in £4,000,000 ordinary stock. Return dated May 23rd, 1939. All stock taken up. £4,000,000 paid. Mortgages and charges, £752,400.

Increase of Capital

Electrical Installations, Ltd. — The nominal capital has been increased by the addition of £25,000, in £1 ordinary shares, beyond the registered capital of £25,000.

Mortgages and Charges

Nigerian Electricity Supply Corporation, Ltd.—Issue on July 4th of £60,000 debenture stock, part of a series already registered.

Rentelevision, Ltd.—Issue on July 7th of £250 debentures, part of a series already registered.

Weldrics (1922), Ltd.—Satisfaction in full on June 6th, 1939, of debenture registered August 17th, securing £1,000 or such sum as might be due thereunder.

R. & W. (Electrical), Ltd.—Debenture charged on the company's undertaking and property, including uncalled capital, dated July 3rd, 1939, to secure £500. Holder: C. H. Crole-Rees, 68, Hookfield, Epsom.

Bridge Electrical Co., Ltd.—Particulars filed of £750 debentures, authorised June 30th, 1939, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Franco-British Electrical Co., Ltd.—Mortgage dated July 10th to secure £42,349 charged on benefit of and all moneys payable under certain agreements relating to hiring of signs amounting to about £84,698. Holders: United Dominions Trust, Ltd.

Leach Electrical and Engineering Co., Ltd.—Particulars filed of £2,250 debentures authorised June 27th, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued. Satisfaction in full on June 27th of debenture dated December 22nd, 1937, and registered December 23rd, 1937, securing £1,500.

Receivers Released

Weldrics (1922), Ltd. — F. H. G. Williams, of 55/56, Chancery Lane, W.C.2, ceased to act as receiver and manager on July 17th, 1939.

Marston Engineering Co., Ltd.—A. Forsyth, 41, St. Mary's Gate, Derby, ceased to act as receiver and manager on June

Winding-up Orders

Architectural Constructional & Electrical Utilities, Ltd.—Winding-up order made on July 24th.

Radio Winton & Television, Ltd.—Winding-up order made on July 24th.

Arctic Fan & Electrical Co., Ltd.—Winding-up order made on July 24th.

Companies to be Struck off the Register

The following companies will, unless cause is shown to the contrary, be struck off the Register at the expiration of three months from July 14th:—Abro Radio & Motor Co., Ltd.; Bullphone, Ltd.; Kinson Electrical Co., Ltd.; Light-o'-Day Electric Lamp Co. (1927), Ltd.; Lunar Electrical Co., Ltd.; and X-rays, Ltd.—The following companies will, unless cause is shown to the contrary, be struck off the Register at the expiration of three months from July 18th:—B. J. & N. Radio & Television Research Laboratories, Ltd.; Combi Electric Co., Ltd.; Electric Ignition (Southend), Ltd.; Espensen Electric Supply Co., Ltd.; Loan-a-Radio (Croydon), Ltd.; and Wireless Manufacturers & Trade Service (Western), Ltd.

Company Liquidations

Air Conditioning (G. W. Cross & Co.), Ltd.—Winding up voluntarily. Liquidator, Mr. L. E. Fillmore, Pinners Hall, Austin Friars, London, E.C.2.

Wildbore's (Radio), Ltd.—Winding up voluntarily. Liquidators, Mr. A. Fitton, Prudential Buildings, Union Street, Oldham, and Mr. A. T. Eaves, 47, Mosley Street, Manchester. Claims must be sent to the former by August 31st.

Varsity Electrics, Ltd.—Final meetings of members and creditors will be held at 333, Gray's Inn Road, W.C.1, on August 15th.

Fenimore, Howlett & Co., Ltd.—First meetings of creditors and contributories held July 26th at 33, Carey Street, Lincoln's Inn, London, W.C.2.

Bankruptcy Proceedings

F. W. Ames, electrical engineer, 73, Havelock Road, Bognor Regis, Sussex, and lately carrying on business at 20, Longford Road, Bognor Regis.—At the resumed hearing of this debtor's public examination recently at the Court House, Church Street, Brighton, the Official Receiver reported that the accounts previously asked for were not satisfactory, and the hearing was, therefore, again adjourned. Debtor, who had attributed his failure to keen competition and bad trade, had a deficiency amounting to £332.

C. S. Harrison, "Macredel," Ismay Road, Chaddesden, Derbyshire, formerly carrying on business at 68, Derby Road, Stapleford, Notts, under the style of Harrison & Harrison, as an electrical contractor and radio engineer.—This debtor, who attended at the Court House, 20, St. Peter's Churchyard, Derby, on July 18th for his public examination, attributed his failure to ill-health and lack of capital. His statement of affairs disclosed a deficiency of £207 on liabilities of £216. The examination was closed.

J. T. Eaton, carrying on business under the name or style of the X.L. Service Station, 13, Bolton Road, Bury, Lancs, wireless dealer.—This debtor applied for his discharge recently at the Court House, Mawdsley Street, Bolton. It was reported that the failure occurred in January, 1933, when the liabilities amounted to £253. The assets had realised £35, and a dividend of 2s. 5d. in the £ had been paid. The discharge was granted subject to two months' suspension.

E. S. Raney, 24, Pollards Nurseries, Bedford Road, Lower Stondon, Bedfordshire, formerly carrying on business at "Minstan," Coldyhill Lane, Newby, Scarborough, Yorkshire, as an electrical engineer.—The public examination was held at the Court House, Luton, recently. The statement of affairs showed ranking liabilities of £503, and assets of £30, leaving a deficiency of £473. Debtor attributed his failure to lack of capital, keen competition which resulted in his under-estimating on contract work, increase in price of materials, and losses on contracts. The examination was adjourned for closing.

B. Harris, wireless dealer, Harwood Road, Fulham, lately carrying on business as "Central Radio" at Kingsland High Street, E.8.—This debtor applied for his discharge at the London Bankruptcy Court on July 13th before Mr. Registrar Kean. He failed in January last with liabilities amounting to £1,407, while his assets realised £96. It is not possible to say what dividend will be paid, and in any event it will be quite small. The discharge was suspended for eighteen months.

A. Burnham (Briardale Radio Services), electrical engineer, 121, Oak Lane, Bradford.—Public examination August 30th at the County Court, Bradford.

L. W. Russell (Russell's Radio Service), radio and electrical engineer, 142, Gravelly Hill North, Erdington, Birmingham.—Last day for receiving proofs for dividend August 2nd. Trustee, Mr. R. K. Clark, Official Receiver, Somerset House, 37, Temple Street, Birmingham.

G. Hopkinson, radio engineer and wireless dealer, 84, Derby Road, Chesterfield.—Last day for receiving proofs for dividend August 2nd. Trustee, Mr. A. J. Rogers, Official Receiver, 22, Regent Street, Park Row, Nottingham.

S. R. Phipps, electrical engineer, Alcester Road, Studley, Warwickshire.—First and final dividend of 1s. 8d., payable at the Official Receiver's Office, 9-11, High Street, Coventry.

B. J. Wheldon, electrician and wireless salesman, 336, Londonderry Road, Langley, Oldbury.—Last day for receiving proofs for dividend August 4th. Trustee, Mr. R. K. Clark, 37, Temple Street, Birmingham, Official Receiver.

E. C. Roqueta, radio dealer, 3, Charteris Road, Woodford Green, Essex.—Receiving order made July 20th on a creditor's petition. First meeting August 2nd and public examination October 24th, both at Bankruptcy Buildings, Carey Street, W.C.2.

J. A. N. B. Tanner, electrical engineer, 3, Jubilee Buildings, Pakefield, Lowestoft.—First and final dividend of 11s. 11d. in the £, payable August 4th at 76, Finsbury Pavement, E.C.2.

Reports and Dividends

The Anglo-Argentine Tramways Co., Ltd., reports gross receipts amounting to £1,852,050 for 1938, as against £2,082,865 for 1937. Expenses took £1,999,721 (£2,251,679), so that there was a deficit of £147,671 (£168,814). After deducting dividend on investment and providing for interest on instalments of an annuity to the City of Buenos Ayres Tramways Co. (1904), Ltd., postponed in accordance with the 1938 scheme of arrangement, the net deficit amounts to £141,901 (£832,011), which increases the accumulated deficit to £722,078. From this has been deducted the balance on the exchange adjustment account (i.e., the difference on conversion of Argentine currency into sterling), leaving a debit balance on revenue account at December 31st of £181,167. Under the scheme of arrangement mentioned by the debenture stockholders no debenture stock interest is payable for 1938. The directors are not yet able to make a forecast as to the future prospects of the company, which it will be appreciated are entirely dependent on the operation of the new Transport Corporation. Certain formalities attaching to the transfer of assets to the Corporation.

The Brush Electrical Engineering Co.—In order to effect a temporary increase in the cash resources to deal with the large number of orders in hand, the company now requires to exercise its power of raising money from its bankers. The *Financial Times* states that the only practicable way of doing so is by the creation of a floating charge on the assets, excluding those assets which are subject to the specific charge securing the prior lien debenture stock. Doubts have been expressed whether the company has power to secure such loans by a floating, as distinct from a fixed, charge. The company has been advised that it has the power, but it desires to put the point beyond doubt and so ensure that the security proposed will be effective. The company therefore proposes that the words "either fixed or floating" to describe the charges which may be created in favour of the bank in priority to the floating charge securing the prior lien debenture stock, shall be inserted in the appropriate places in the trust deeds securing the various classes of debenture stock. The maximum amount of the borrowing (£100,000) will not be affected in any way. The scheme of arrangement of May, 1938, contained no limitation on the type of charge which might be created in exercise of the power reserved, and the company is confident that the debenture stockholders will approve the proposal.

A net profit is reported for 1938 of £1,983, as compared with £1,966 for the six months to December 31st, 1937, and after allowing £1,292 for reconstruction expenses, £691 is carried forward. The debit balance of £99,983 on the profit and loss account was eliminated under the reconstruction scheme. The report states that at December 31st there remained option certificates outstanding in respect of £187,404 ordinary capital. Meeting: August 1st.

The Engineering and Lighting Equipment Co., Ltd.—The list opened and closed on Wednesday last for an offer for sale by the Whitehead Industrial Trust of 100,000 7 per cent. cumulative redeemable preference shares of £1 each at par (redeemable at 25s. per share), and 325,000 ordinary shares of 2s. each at par. The company was formed on July 11th to take over as from March last the old-established business of the same name. It is capitalised at £200,000, of which all the preference and 325,000 of the ordinary shares purchased by the Whitehead Industrial Trust are offered for sale. The business consists of two main sections. The lighting side comprises the manufacture of heavy lighting equipment for municipalities and other large consumers and the manufacture of smaller equipment, including accessories and fittings for domestic and office illumination. The general engineering section covers a wide range of manufactures, including main control switchboards for ships. There will be no change in management, Mr. W. Bird (managing director) and Mr. G. J. Wells (sales director) having been connected with the business for over thirty years. Mr. S. A. Marples (chairman) and Mr. W. Jewitt (director) have been associated with the vendor company since its incorporation.

The Victoria Falls & Transvaal Power Co., Ltd.—Presiding at the annual meeting held on July 25th, Mr. A. E. Hadley (chairman and managing director) said that the maximum sustained load at power stations amounted to 508,000 kW, an increase of 14 per cent. during the year under review, while that for compressed air increased to 74,000 kW. The sales of electricity and compressed air during the year exceeded 3,000 million kWh. The Klip power station had now ten out of twelve large generating sets at work, while the eleventh had been shipped and the last was expected to leave the makers' works during the year. The work on the first section of 100,000 kW of the latest station, called Vaal, was proceeding steadily. The hydro installation at the Victoria Falls, which went into service early last summer, had continued to operate satisfactorily, supplying the town of Livingstone.

The Nigerian Electricity Supply Corporation, Ltd., held its annual meeting on July 25th, when Mr. E. S. Marks (chairman and managing director) said, in referring to the general outlook for the company's business, that they were dependent on the prosperity of the Nigerian tin mining industry, and that according to the rise and fall of the scale of operations of the mines as allowed by the permitted output under international control, so did their prosperity rise and fall as well. They were at present work-

ing on the lowest basis of their contracts for the supply of power to consumers, but all the same they were earning sufficient revenue to meet their obligations. Given normal times, they would have no difficulty in exceeding the figures presented in the financial year 1937-38.

W. & T. Avery, Ltd.—Presiding at the annual meeting on July 25th Sir J. Fortescue Flannery, Bt. (chairman), said that they were continuing their policy of modernising their production facilities and substantial quantities of plant were provided during the year under review. The new steel fabrication department was now in full working order, and the machinery both at the Soho foundry, Birmingham, and at the various branches used in manufacture and repair had been steadily maintained. They had erected and were erecting modern buildings, comprising showrooms, offices and workshops. Their associated companies in South Africa, Australia and New Zealand, and their branches in India and other parts of the Empire, had all given a good account of themselves, in spite of the difficult trading conditions.

Thomas Bolton & Sons, Ltd., report a manufacturing profit of £203,925 for the year ended March 31st last. This is £84,549 less than in 1937-38, and is attributed mainly to the trade recession consequent upon the unsettled international situation, particularly during the latter half of the year. After providing for all expenses and charges, including £45,000 (same) to depreciation and £4,000 (£7,000) to staff bonus, there is a net profit of £64,107 (£114,847 after transferring £18,000 to tax reserve and £5,000 to retirement compensation). A final dividend of 5 per cent., making 7½ per cent. (10 per cent.) is to be paid and a sum of £10,000 (£20,000 and £10,000 to obsolescence reserve) goes to general reserve, leaving £55,120 (£53,512) to be carried forward.

Simms Motor Units, Ltd.—The list was to open yesterday (Thursday) for an issue at par of £100,000 5 per cent. first mortgage convertible debenture stock. The proceeds of the issue will be used to pay for the balance of the cost of the factory extension and equipment, repayment of bank overdraft, and to provide additional working capital. The company's business includes the manufacture of specialised electrical equipment for the heavy class of motor vehicles, such as omnibuses, coaches, lorries, &c. More recently increasing sales have been effected for aircraft, marine and industrial purposes and these markets are being steadily developed.

The Mexican Light & Power Co., Ltd.—A committee consisting of Mr. John Davidson, chairman and managing director of the British Empire Trust, Sir Alexander Roger, Mr. Gilbert Johnstone, Mr. B. H. Binder, Mr. H. C. Drayton, Mr. Cutler and Mr. R. H. Collis has been formed on behalf of the bondholders of the company, which defaulted on its 5 per cent. second mortgage 50-year bonds on June 1st.

The London Electrical & General Trust records a gross revenue of £55,781 for the year ended June 30th last, as compared with £58,148 for 1937-38. After payment of debenture interest and general charges there is a net revenue of £33,603 (£35,048). A final dividend of 3 per cent., making 5½ per cent. (same), is to be paid, leaving £14,348 (£12,845 after allocating £5,000 to general reserve) to be carried forward.

Falk, Stadelmann & Co., Ltd. report a reduction in the trading profit from £129,046 in 1937-38 to £82,803 in the year ended March 31st, 1939. Of this staff pensions take £5,757 (£3,000), N.D.C. £1,000 (£5,000), income tax £8,219 (£11,684), and investment depreciation £282 (£1,400), leaving a net profit of £67,545 (£107,962). After paying dividends on preference and ordinary shares, £28,715 (£27,320) is carried forward. No allocation is made to reserve: last year £15,000 was set aside for this purpose.

James Howden & Co. report a profit of £89,563 in their accounts for the ten months to April 30th, the first since the business was converted into a public company. After deducting interest and investment written off, the net profit for the ten months was £80,457, subject to tax. Reserve receives £20,000 and £7,500 is set aside for A.R.P. It is proposed to pay a dividend of 15 per cent., and to carry forward £18,659 (against £1,402 brought in).

Thorn Electrical Industries, Ltd., reports a net profit for the year to March 31st of £35,058, as compared with £31,537 in the preceding year. Reserve receives £15,000, and the ordinary dividend for the year is maintained at 20 per cent., leaving £11,916 to be carried forward (against £8,533 brought in).

The General Electric Co. of America reports earnings for the first six months of 1939 amounting to $16,370,000, equal to 57 cents a share, compared with 46 cents a share for the corresponding period of 1938.—*Reuter.*

Vickers, Ltd., have declared dividends of 2½ per cent. actual, less tax, on the preferred 5 per cent. stock and the 5 per cent. preference stock, and 2½ per cent. actual, free of tax, on the cumulative preference stock.

Britannia Electric Lamp Works has announced a first and final dividend of 7 per cent., less tax, for the year to April 30th, as against 6 per cent., actual, for the period October 29th, 1937 (date of incorporation), to April 30th, 1938.

The London Electric Supply Corporation, Ltd., is maintaining its interim dividend at 3 per cent., less tax.

The Metropolitan Electric Supply Co., Ltd., is paying an interim dividend on the ordinary stock of 3 per cent. (same).

The City of London Electric Lighting Co., Ltd., is to pay an interim dividend of 3½ per cent. (same).

Mather & Platt, Ltd., are maintaining their interim dividend at 4 per cent.

The Electrical Industries Trust, Ltd., is to make a half-yearly distribution of 5.4d. (6d.) per unit, free of tax.

The Anglo-American Telegraph Co., Ltd., is to pay quarterly dividends of ¾ and 1½ per cent., respectively, on its ordinary and preferred ordinary shares (same).

Electrical Imports of Malaya

IN the imports into Malaya last year of electrical machinery there was an increase of 50 per cent. in value compared with 1937, a decline in those of motors being offset by substantial advances in generators, transformers, convertors, switchgear and unspecified machinery.

In imports of electrical apparatus there was, on the whole, a small decline. The total value of both groups was $8,700,000, against $8,278,000 in 1937 and $5,800,000 in 1936 (the Straits dollar=2s. 4d.). These satisfactory results were attained in spite of the restriction on the production of tin and rubber, and were attributable to activities in connection with measures of defence.

The United Kingdom remained the most important supplier of equipment; the share of Japan declined throughout.

With regard to prospects in the current year, the same main factors are likely to prevail. There is still a large amount of work to be done in connection with the Singapore Naval Base and on R.A.F. works, and all this will involve much activity in building generally. On the other hand, with a continuance of restriction on the output of rubber and tin, there is little possibility of an increase in buying by these two important Malay industries.

The following table, which is based on recently issued official statistics, shows the imports, by countries, of the principal electrical items last year, with notes of increases or decreases compared with 1937.

	1938 $ (000)	Inc. or dec. on 1937 $ (000)
Automobile lamps—		
Total	19,900	+ 800
From United Kingdom	13,300	+ 1,900
,, Japan	4,100	− 2,000
Flash-lamp bulbs—		
Total	112,000	− 13,000
From United Kingdom	19,800	+ 18,200
,, United States	16,100	+ 200
,, China	38,800	†
,, Japan	2,600	− 25,100
Electric hand flash lamps—		
Total	255,600	− 200,400
From United Kingdom	2,100	− 1,300
,, Hong Kong	87,800	− 184,200
,, United States	40,600	− 37,300
,, China	18,900	†
Other electric lamps—		
Total	329,000	− 13,000
From United Kingdom	295,000	+ 15,000
,, Europe	30,000	+ 6,200
,, Japan	700	− 34,400
Lighting accessories and fittings—		
Total	296,000	+ 70,000
From United Kingdom	266,000	+ 89,000
,, Japan	3,300	− 31,700
Refrigerators—		
Total	373,000	− 139,000
From United Kingdom	45,000	− 40,000
,, United States	318,000	− 84,000
Fans—		
Total	193,000	− 43,000
From United Kingdom	171,000	− 34,000
,, Italy	11,000	†
Batteries and accumulators—		
Total	281,600	− 33,400
From United Kingdom	175,000	− 29,000
,, United States	43,700	− 22,300

	1938 $ (000)	Inc. or dec. on 1937 $ (000)
Batteries for hand flash lamps—		
Total	681,000	− 156,000
From United Kingdom	8,200	− 800
,, British Dominions	173,200	− 14,800
,, United States	252,000	− 142,000
,, Japan	200	− 2,900
Electrical instruments other than telegraph or telephone—		
Total*	133,000	− 19,000
Submarine telegraph and telephone cables—		
Total*	160,000	− 92,000
Other telegraph and telephone cables—		
Total	45,600	− 199,400
Other (rubber) insulated wire and cables—		
Total	752,000	+ 61,000
From United Kingdom	721,000	+ 114,000
,, Europe	26,000	− 18,800
Insulated (not rubber) wire and cables, other than telegraph or telephone—		
Total*	611,000	+ 248,000
Radio receiving sets, excluding valves—		
Total	405,000	− 77,000
From United Kingdom	152,000	− 23,000
,, Europe	126,000	+ 34,300
,, United States	127,000	− 87,000
Radio-gramophones—		
Total*	59,200	+ 15,500
Radio transmitting apparatus, excluding valves—		
Total*	30,600	− 54,700
Valves—		
Total	46,000	− 13,000

	1938 $ (000)	Inc. or dec. on 1937 $ (000)
From United Kingdom	3,800	− 31,700
,, United States	3,200	− 17,100
,, Japan	15,100	†
Other radio accessories and parts—		
Total	79,900	− 38,600
From United Kingdom	43,100	− 12,400
,, United States	24,600	− 23,600
Telegraph and telephone instruments and apparatus—		
Total*	355,000	+ 118,000
Electrical goods and apparatus not elsewhere specified—		
Total	996,000	+ 237,000
From United Kingdom	745,000	+ 220,000
,, Europe	73,000	+ 26,000
,, United States	136,000	− 2,000
,, Japan	3,400	− 15,600
Transformers and convertors—		
Total*	564,000	+ 290,000
Generators—		
Total	345,000	+ 106,000
From United Kingdom	292,000	+ 82,000
,, Europe	29,000	+ 12,300
,, United States	22,000	+ 12,400
Motors—		
Total	292,000	− 101,000
From United Kingdom	252,600	− 105,400
,, Europe	23,000	+ 4,200
Switch and control gear—		
Total*	635,600	+ 252,600
Electrical machinery, not elsewhere specified—		
Total	498,000	+ 207,000
From United Kingdom	441,000	+ 214,000
,, Europe	43,000	− 8,000

* Mainly from United Kingdom.
† Comparative figures not available.

STOCKS AND SHARES

TUESDAY EVENING.

THE international situation is deemed to be less threatening than it was at the beginning of the month; and, for this reason, Stock Exchange markets have taken on a more tranquil appearance. Negotiations over the Anglo-French-Russian Pact still drag along without any definite indication of completion, although an occasional hint from Government quarters suggests that the matter has now become whittled down to discussions over a few knotty points. Apprehension of any immediate outbreak in connection with Danzig is no longer entertained.

It can hardly be said that the air is sufficiently clear, at present, for business in stocks and shares to make any pronounced recovery. Confidence will have to become more convalescent than it is now, for anything like active business conditions to be restored. There are 4,000 members of the Stock Exchange. That nearly a thousand of them occasionally go through a business day without booking one bargain, is not likely to be challenged as an exaggerated statement. Nevertheless, in some directions mild activity prevails. A fair amount of business is passing in the shares of electrical construction and manufacturing companies. The markets for fixed-interest securities continue under the cloud of forthcoming Government borrowing on a large scale. The American market has been giving a taste of its quality for violent fluctuations, and business in the States, according to indications accepted as being worthy of attention, is certainly improving.

Gilt-edged Stocks

The gilt-edged market knows roughly the number of millions of money to be raised in loans by the Treasury: the time and terms of the next issue are awaited. Under the circumstances, the market can be excused its air of wary watchfulness. The inevitable and constant trickle of selling meets little in the way of opposition. The disposition of idle capital seems to favour the deferment of action until the Government asks for the new money. Speculation is rife as to the likely terms of the loan. Meanwhile it is noted, in this connection, that an offer last week of 3½ per cent. Sudan stock, guaranteed by the British Government, at the apparently fair price of 97, was 60 per cent. underscribed. Stocks of the Central Electricity and London Transport Boards generally hold their ground. Just outside the gilt-edged range, the new North Metropolitan Power and Wessex Electricity debentures stand close to the issue prices.

Electricity Supply

Apart from losses of 1s. 6d. in South Londons and Electric Supply Corporations, the market in electricity supply shares shows little change on the week. Sir John Simon's recent reference to utility companies' profits continues to be the subject of some discussion, but of no serious concern. Attention was paid to the increase of nearly a million pounds since April in the amounts sanctioned by the Electricity Commissioners to be borrowed by public authorities for electricity supply purposes. Another matter for comment is the British Electrical Development Association's new booklet on the progress of the electrification of rural areas; the length of low-voltage mains in these areas has increased, it is stated, from 3,700 miles in 1929 to over 20,000 miles now. In the overseas electricity supply group, Palestine Electrics at 21s. 3d. remain depressed by the cut in the dividend from 7½ to 5 per cent., tax free, occasioned by the sharp reduction in profits. Jerusalem Electrics at 23s. are also on the dull side, although profits have been well maintained and the dividend is kept up to 7 per cent.

Cable and Wireless Traffics Index

The traffic index published monthly by the Cable and Wireless combine came to an end with the issue of the June figure. The series finished on a low note. At 65.9 the index was the lowest of the year and, also, the smallest for June since 1932. For this result, there is compensation in the reasons for the decision to discontinue the series. Lord Pender explained at the meeting in May that the index gave a misleading impression of the true state of affairs: it related to only one of the company's three main sources of revenue. Certainly this contention was borne out in the last financial year, when the accounts made a much better showing than the traffics index had led people to expect. It is of some interest to note that the average of the six figures published this year is a fraction better than the corresponding average in 1938. Prices of the stocks have been fluctuating somewhat aimlessly. At 51 the ordinary stock is a fraction up on the week, but the preference has shed a point to 88½.

Brush Electrical Results

The market sets little store by the Brush Electrical Engineering Company's results for the year ended in December. These show a net profit of £691. Interest is centred chiefly on how results in the current year will be affected by the developments carried out during the period. The balance sheet now published reflects the capital reorganisation sanctioned last July, when 75 per cent. of the ordinary capital was written off, and the bank and debenture loans were dealt with. Fresh capital was subsequently raised by the issue of ordinary, debenture and preference stocks. Shortly before publication of the accounts, a report appeared that steps were to be taken to raise a bank loan. A temporary increase in cash resources is called for to deal with the large amount of work in hand.

Reasons for expecting better things in the Brush Company's current year have to do principally with last September's purchase of the Petter oil-engine business, and with subsequent progress reports of an encouraging character. The Petter deal was officially described as meaning an additional turnover of £300,000, and was expected to result not only in a material contribution to revenue, but also in a big saving of overhead expenses. In the same month, a progress statement reported turnover to be greater than for many years. Following an access of new orders, all departments of the works were well employed: and the whole of the works were being thoroughly reorganised and replanned. Other statements have been made in the same vein. The price of the ordinary stock has eased off this week to 5s. Speculative interest arises from time to time in the option certificates, which give the holder the right to subscribe for the ordinary shares at par until September, 1943. The certificates last changed hands at 4s. 6d.

Traction Stocks

With the approach of the half-yearly dividend decisions, the Home Railway market stands firm. Another good batch of traffic returns, however, met with little response, Southern preferred being, in point of fact, slightly lower on the week at 70. Tillings are 2s. better, at 47s., and Bristol Trams, with a further rise of 1s. 3d. to 52s., are again a strong feature: the company has raised this year's interim dividend. Among overseas traction concerns, Brazilian Tractions, at 9⅜, have shown indifference to the strength of Wall Street, which exercises, as a rule, notable influence on the shares. Rio bonds, at 67, are a dull spot among South American issues. Anglo Argentine Tramway stocks were moved little by the report which covers the company's last year as a trader on its own account. In February, the undertakings were handed over to the Buenos Aires Transport corporation in exchange for stock in that Corporation. The 4 per cent. income stock is a point lower at 11. Elsewhere, Calcutta Tramways have picked up to 23s.

A Newcomer

Subscription lists opened on Wednesday of this week for the issue of 2s. ordinary and £1 redeemable 7 per cent. preference shares in the Engineering & Lighting Equipment Company. The firm is old-established as a supplier of heavy lighting equipment to municipalities and other large consumers. It is well-known as a manufacturer of other electrical and engineering products. The company has an imposing list of customers. The prospectus shows that the last year's profits were equal to seven times the preference dividend and to more than 35 per cent. on the ordinary capital. On the basis of average profits in the last three years, the cover for the preference dividend is 4½-fold, and the earnings on the ordinary shares over 18 per cent. The preference shares have the attraction of being redeemable, at 25s. per share, not later than 1954. Both classes of capital were offered at par. In advance of the issue it was considered that the terms represented a fairly handsome concession to the present unenterprising mood of capital.

American Conditions

Reference has already been made to the improved state of business affairs in America. The companies connected with communications, of which Western Union is a prominent example, are publishing good figures. These show, as well as anything can do, the revival that is taking place over wide industrial areas in America. The ban which the British Treasury has (very politely) placed upon the investment of British money in foreign stocks at the present time, imposes, of course, a handicap upon the employment of money on this side in the shares of American companies. But notwithstanding this, speculation is following the market very closely.

To a minor extent, American industries derive advantage from the state of warlike tension in Europe. The trade conditions in Canada are corresponding, to some extent, with those in the United States. Expectation of a good harvest is also having a cheery effect. The shares of Canadian utility companies are beginning to receive attention. Montreal Power and Shawinigan Power shares are both a little better. B.C. Power B shares hardened to 2⅜. The A remain at 29½.

Company Results

Falk Stadelmann ordinary shares have recovered to some extent from the fall to about 18s. 9d. which followed the cut in the dividend from 10 to 6 per cent. They are now quoted around 20s., which compares, however, with 27s. at one time earlier this year. At the meeting a year ago the chairman referred to an inauspicious opening to the new period. In the event, the profits of these manufacturers of lighting, heating and cooking equipment show a reduction in profits of £46,200, at £82,800. The net figure comes out at £67,500, against £108,000 previously.

Thorn Electrical Industries achieved a modest improvement in the net profits for 1938-9. At 9s. 3d., the 5s. ordinary shares show a return of well over 10 per cent. on the money, although the repetition of the 20 per cent. dividend takes less than half the amount actually available for distribution. The balance has gone to fortify an already strong financial position.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price July 25	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies							
Bournemouth and Poole ...	68/3	63/9	15	15	63/9	—	£4 14 4
British Power and Light ...	30/9	26/–	7	7	28/6	—	4 18 3
City of London	33/9	31/–	7½	7½	31/–	—	4 16 9
Clyde Valley	37/9	34/–	8	8	37/–	—	4 6 6
County of London ...	46/9	41/9	10½	10½	43/–	+1/–	4 17 8
Edmundson's :							
7% Pref....	31/6	30/–	7	7	30/–	—	4 13 4
Ord.	27/9	23/–	9	6	25/9	—	4 13 2
Elec. Dis. Yorkshire ...	41/6	37/9	9	9	38/9	—	4 12 9
Elec. Fin. and Securities ...	47/9	45/–	12½	12½	47/6	—	5 5 3
Elec. Supply Corporation...	51/9	48/–	12	12	47/6	−1/6	5 1 1
Isle of Thanet	20/–	18/6	4	4	18/6	—	4 6 6
Lancs Light and Power ...	34/6	29/–	7½	7½	30/9	—	4 17 7
Llanelly Elec.	22/6	21/–	5½	5½	21/–	—	5 4 9
Lond. Assoc. Electric ...	29/3	25/9	7	7	25/9	—	5 8 9
London Electric	34/3	32/–	7	7	33/–	—	4 4 10
London Power Deb. Red....	106½	102½	5	5	104	—	4 16 2
Metropolitan	51/–	45/3	12	12	47/6	—	5 1 0
Midland Counties	38/9	34/–	8	8	37/–	+9d.	4 9 0
Mid. Elec. Power	41/9	38/3	8	9	38/9	—	4 13 0
Newcastle Elec.	28/9	26/6	7	7	27/–	—	5 3 8
North Eastern Electric :							
Ordinary...	32/3	28/6	7	7	30/6	—	4 11 10
7% Pref....	32/6	30/–	7	7	31/6	—	4 9 0
Northampton	48/–	45/–	10	10	47/6	—	4 4 2
Notting Hill 6% Pref. (£10)	13½	12¾	6	6	12¾	—	4 14 1
Northmet Power :							
Ordinary...	46/6	41/6	10	10	43/3	+9d.	4 12 6
6% Pref....	29/–	27/6	6	6	27/6	—	4 7 3
Richmond Elec.	29/–	27/3	7	7	27/6	—	5 1 10
Scottish Power	38/9	33/9	8	8	36/3	—	4 8 2
Southern Areas	22/9	19/6	5	5	20/–	—	5 0 0
South London	30/9	28/–	7	7	26/6	−1/6	5 5 8
West Devon	23/3	22/6	5	5	22/6	—	4 9 0
West Glos.	21/3	18/–	2	2½	18/6	—	2 14 1
Yorkshire Elec.	38/6	34/9	8	8	37/–	—	4 6 6
Overseas Electricity Companies							
Atlas Elec.	4/3	2/–	Nil	Nil	2/6	—	—
Calcutta Elec.	39/–	29/–	10*	10*	30/–	+1/–	—
Cawnpore Elec.	34/6	28/3	10	10	28/3	—	7 1 7
East African Power ...	26/3	22/6	7	7	22/6	—	6 4 5
Jerusalem Elec.	24/6	23/–	7	7	23/–	−1/–	6 1 9
Kalgoorlie (10/–)	10/6	9/6	7½	7	10/3	—	7 6 4
Madras	31/–	22/6	8*	8*	22/6	—	—
Montreal Power	34½	31	1½	1½	34¾	+½	—
Palestine Elec. "A" ...	29/6	21/3	7½*	5*	21/3	—	4 14 2
Perak Hydro-electric ...	18/9	15/–	7	6	15/9	—	7 12 4
Shawinigan Power ...	23½	20	85cts.	83cts.	21½	+½	—
Tokyo Elec. 6%	61	42½	6	6	44½	+2	13 9 8
Victoria Falls Power ...	72/–	60/–	12½	15	70/–	—	4 5 9
Whitehall Investments Pref.	19/6	16/–	7½	7½	18/–	−1/–	8 6 8
Public Boards							
Central Electricity :							
1950–70	112	106	5	5	110	—	4 11 0
1955–75	115½	108	5	5	111½	+1	4 19 6
1951–73	106½	103½	4½	4½	104½	—	4 6 2
1963–93	95½	86	3½	3½	91½	—	3 16 6
London Elec. Trans. Gtd.	88½	84	2½	2½	85½	—	2 18 6
London & Home Counties							
1955–75	107½	105	4½	4½	106½	—	4 4 6
Lond. Passenger Transport :							
A...	114½	104½	4½	4½	107½	—	4 3 9
B...	117½	105	5	5	108½	−1	4 12 4
C...	83½	64½	4½	4	73½	—	5 8 10
West Midland Joint Elec.,							
1948–68	112½	108½	5	5	108½	—	4 12 2
Telegraph and Telephone							
American Tel. & Tel. ...	180	159	9	9	174½	−5	5 3 3
Anglo-Am. Tel. :							
Pref.	101½	89½	6	6	95	—	6 5 8
Def.	23¾	19	1½	1½	21½	−½	6 19 4
Anglo-Portuguese	24/–	19/9	8	8	20/–	—	8 0 0
Cable & Wireless :							
5½% Pref.	95½	75	4½	5½	88½	−1	6 4 4
Ord.	55	34	4	4	51	+½	7 16 10
Income	100	95½	—	—	97½	−½	4 2 1
Canadian Marconi $1 ...	5/6	3/9	—	Nil	5/6	—	—
Globe Tel. & Tel. :							
Ord.	31/3	23/6	7½*	7½*	30/–	—	5 0 0
Pref.	26/9	23/3	6	6	25/–	—	4 16 0
Great Northern Tel. (£10)	38	27½	20	20	29	—	6 18 0
Inter. Tel. & Tel.	10½	7	Nil	Nil	7¾	+½	—
Marconi-Marine	30/–	23/–	7½	10	27/6	—	£7 5 6
Oriental Telephone Ord. ...	2½	46/3	12*	12*	2 7/16	—	4 16 0
Radio Corpn.	8⅞	6	8	6	6⅝	+⅛	—
Telephone Props.	14/–	12/9	5	6	13/9	—	8 14 6
Telephone Rentals (5/–) ...	10/–	8/6	10	10	9/3	—	5 8 1
Western Union	28	19½	2⅜	—	27½	—	—
Traction and Transport							
Anglo-Arg. Trams :							
First Pref. (£5)	7/6	3/6	Nil	Nil	6/3	—	—
4% Inc.	16	7	Nil	Nil	11	−1	—
British Electric Traction :							
Def. Ord.	1025	700	5	5	850	—	—
Pref. Ord.	164	155	8	8	155	—	£5 3 3
Bristol Trams	51/–	37/3	8	10	52/–	+⅛	3 17 0
Brazil Traction	13	7⅞	$1	50c.	9⅜	—	—
Calcutta Trams	25/6	22/–	8	8	23/–	+6d.	6 19 2
Cape Elec. Trams	18/–	16/9	5	6	17/6	—	6 17 2
Lancs Transport	36/6	32/6	10	10	35/–	—	5 14 3
Mexican Light :							
1st Bonds	25	21	5	5	25	—	—
Rio 5% Bonds	81	47	5	5	67	−3	7 9 3
Southern Rly :							
5% Prefd.	75½	48	5	5	70	−½	7 2 10
5% Pref....	99½	80	5	5	96½	—	5 3 8
T. Tilling	48/3	39/6	10	10	47/–	+2/–	4 5 1
Tilling & B.A.	53/–	50/–	10	9*	52/6	—	3 8 7
West Riding	37/9	31/3	10	10	36/3	—	—
Equipment and Manufacturing							
Aron Electricity Ord. ...	32/3	28/9	15	15	28/9	—	10 8 8
Assoc. Elec. :							
Ord.	45/3	34/9	10	10	40/–	—	5 0 0
Pref.	36/6	34/–	8	8	35/–	—	4 11 5
Automatic Telephone & El.	46/6	39/3	10	12½	46/3	—	5 8 3
Babcock & Wilcox ...	45/–	37/–	10	12½	45/9	+9d.	5 11 7
British Aluminium Ord. ...	58/3	48/9	12½	12½	56/3	+1/9	4 9 0
British Insulated Ord. ...	88/–	77/–	20	20	81/3	+½	4 18 6
British Thermostat (5/–)...	16/–	12/–	18½	18½	13/9	+9d.	6 14 7
British Vacuum Cleaner (5/–)	22/6	14/–	40	40	15/–	—	—
Brush Ord.	5/9	4/6	Nil	Nil	5/–	−3d.	—
Callender's	92/–	60/–	20	15	65/–	+⅛	4 12 4
Chloride Elec. Storage ...	82/3	62/6	20	15	3 5/16	+⅛	4 10 4
Consolidated Signal ...	96/–	80/9	36½	36½	82/6	—	8 16 9
Crabtree (10/–)	25/6	21/6	17½	17½	22/6	—	7 15 4
Crompton Parkinson :							
Ord. (5/–)	21/–	14/9	12½	15	18/9	+⅛	—
E. K. Cole (5/–)	9/–	4/–	10	Nil	5/–	+1/–	—
Elec. & Musical Industries							
(10/–)	14/9	8/9	10	5	10/–	—	5 0 0
Electric Construction ...	38/6	30/6	12½	13½	35/–	−⅛	7 14 3
Enfield Cable Ord. ...	58/6	2½	25	16½	50/–	—	6 10 0
Electrical Switchgear (10/–)	27/–	23/9	16	16	23/9	—	6 14 9
English Electric	36/–	30/3	10	10	36/3	+9d.	5 10 4
Ensign Lamps (5/–) ...	15/–	13/9	—	25	15/9	+1/–	7 18 8
Ericsson Tel. (5/–) ...	43/–	35/–	25*	25*	40/–	—	3 2 6
Ever Ready (5/–)	24/–	18/6	35	30	18/6	—	8 2 2
Falk Stadelmann	27/–	18/9	10	6	20/–	—	6 0 0
Ferranti Pref.	25/6	22/6	7	7	23/–	—	6 1 9
G.E.C. :							
Pref.	31/9	29/3	6½	6½	31/3	—	4 3 2
Ord.	82/–	70/9	17½	20	74/6	+6d.	5 7 1
Greenwood & Batley ...	27/6	24/6	7	15	26/3	—	11 9 0
Hall Telephone (10/–) ...	22/3	19/3	15	15	20/–	−9d.	7 10 0
Henley's (5/–)	21/–	17/9	20	20	18/9	—	5 6 8
4½% Pref.	23/–	21/–	4½	4½	21/3	—	4 4 8
Hopkinsons	46/3	37/3	12½	15	45/–	—	6 13 4
India-Rubber Pref. ...	21/3	20/–	5½	5½	20/–	—	5 10 0
Intl. Combustion	120/–	97/–	32½	32½	5⅜	+1/16	5 12 10
J. Lucas	60/–	52/–	15	15	58/9	—	5 2 0
Johnson & Phillips ...	41/3	32/–	12½	12½	40/–	+1/16	6 5 0
Lancashire Dynamo ...	68/–	57/6	25	25	57/6	—	8 13 8
Laurence Scott (5/–) ...	12/–	10/–	15	15	10/6	—	7 2 10
London Elec. Wire ...	31/6	28/6	12	7½	28/9	—	5 4 4
Mather & Platt	50/–	42/6	13½	13½	45/–	—	6 0 0
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	—	5 3 6
Murex	85/9	63/9	20	20	77/6	+1/16	5 3 0
Pye Deferred (5/–) ...	13/9	7/6	25	25	9/6	—	13 3 2
Revo (10/–)	35/6	29/–	17½	17½	28/6	−6d.	6 2 8
Reyrolle	61/–	52/6	12½	12½	56/3	—	4 9 0
Siemens Ord.	26/9	20/6	7½	7½	23/9	—	6 6 4
Strand Elec. (5/–) ...	5/6	4/6	5	10	4/3	−3d.	12 2 6
S. Smith (1/–)	9/9	6/–	37½	50	7/6	—	6 13 4
Switchgear & Cowans (5/–)	15/–	11/3	20	20	12/–	—	8 6 8
Telegraph Condenser (10/–)	7/6	5/–	5	—	7/6	—	—
Telegraph Construction ...	2½	37/6	10	10	37/6	—	5 6 8
Telephone Mfg. (5/–) ...	10/–	8/–	9	9	9/3	—	4 17 3
Tube Investments... ...	91/–	82/9	23½	23½	87/6	—	5 9 7
Vactric (5/–)	4/3	2/3	10	4	2/3	—	8 18 0
Vickers (10/–)	24/6	18/3	10	10	18/6	—	5 8 1
Westinghouse Brake ...	54/9	43/9	17½	17½	48/9	—	7 3 5
Walsall Conduits (4/–) ...	31/9	24/–	55	55	27/–	—	8 3 0
West, Allen (5/–)	7/6	5/9	7½	10	6/9	—	7 8 2

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, W.C.2.

1937

23187. "Means for the transmission of telegrams over telephone wires." E. Reisz. September 24th, 1937. (508103.)

29153. "Electric arc convertors." H. W. K. Jennings (Allgemeine Elektricitäts-Ges.). October 25th. 1937. (508467.)

32947. "Apparatus for converting direct current into alternating current." Technical Inventions, Ltd., and R. J. Elsome-Jones. November 20th, 1937. (508370.)

33223. "Switch-frogs for the overhead conductors of electric traction systems." British Insulated Cables, Ltd., London Passenger Transport Board, T. C. Broom, and H. J. Powell. December 1st, 1938. (Cognate applications 20258 and 27806/38). (508470.)

34130. "Impulse transmitters of the dial type for use in telephone or like systems," Automatic Telephone & Electric Co., Ltd. (Associated Electric Laboratories, Inc.). January 1st, 1938. (508472.)

35390. "Electric welding apparatus." British Thomson-Houston Co., Ltd. December 21st, 1936. (Cognate applications 35391-5/37.) (Addition to 495484.) (508200.)

35589. "Electro-magnetic separators." H. H. Thompson, A. E. Davies and H. E. Hutter. December 23rd, 1937. (508379.)

35772. "Electric impulse transmitter." W. R. Schytte, M. B. Richter and Telefon Fabrik Automatic Aktieselskabet. December 24th, 1937. (508474.)

35791. "Television or other signal transmission systems." A. D. Blumlein. December 24th, 1937. (Cognate application 16079/38.) (508377.)

36003. "Electric cables." British Insulated Cables, Ltd., F. J. Brislee and L. Macfarlane. December 29th, 1937. (508316.)

36007. "Electrically maintained balance and contact device for clocks." F. A. Lanfranconi, and British Vacuum Cleaner & Engineering Co., Ltd. December 29th, 1937. (Addition to 491487.) (508380.)

36011. "X-ray apparatus." W. Watson. December 29th, 1937. (508381.)

36096. "Electric control of systems comprising a plurality of similar devices." General Electric Co., Ltd., H. J. Coates and A. B. Price. December 30th, 1937. (508544.)

36105. "Device for regulating the speed and maintaining constant the actually adjusted speed of small electric motors." K. G. Allstrom. December 30th, 1936. (508546.)

36136. "Electric motor control systems." British Thomson-Houston Co., Ltd. December 31st, 1936. (508209.)

36137. "Control of alternating-current torque motors in electric control systems." British Thomson-Houston Co., Ltd., and F. A. Haigh. December 30th, 1937. (508317.)

36138. "High-frequency coils and magnetisable coils for such coils." Siemens & Haske Akt.-Ges. December 30th, 1936. (508484.)

36185. "Electric insulators of the strain type." L. A. Chapman. December 31st, 1937. (508550.)

36197. "Electrical switches of the snap-action type." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and B. G. Harrison. December 31st, 1937. (508491.)

36223. "Cathode-ray tubes and like electron-discharge devices." Baird Television, Ltd., L. C. Daniels and G. E. Marcus. December 31st, 1937. (508552.)

36234. "Electron-discharge devices and envelopes therefor." Standard Telephones & Cables, Ltd., W. T. Gibson, W. R. Moscrip and W. A. Windsor. December 31st, 1937. (508494.)

36263. "Excitation control of dynamo-electric machines." G. A. Juhlin, and Metropolitan-Vickers Electrical Co., Ltd. December 31st, 1937. (508504.)

36297. "Impulse-transmitter of the dial type for use in telephone or like systems." Automatic Telephone & Electric Co., Ltd. January 2nd, 1937. (508511.)

36298. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. December 31st, 1936. (508512.)

1938

5. "Electric-discharge lamps." F. W. Thorpe. January 1st, 1938. (508558.)

37. "Frequency-indicating instruments." Marconi's Wireless Telegraph Co., Ltd., G. N. Wright and C. Austin. January 1st, 1938. (508560.)

38. "Modulated carrier-wave transmitters." Marconi's Wireless Telegraph Co., Ltd., N. H. Clough and E. Green. January 1st, 1938. (508515.)

66. "Devices for securing electric bulb lamps in their sockets," January 3rd, 1938. (N. Bailey and J. R. Foulds.) (508217.)

103. "Electrical apparatus wherein a current is switched off when it exceeds (or alternatively falls below) a predetermined value." General Electric Co., Ltd. (Patent Treuhand-Ges. für Elektrische Glühlampen.) January 3rd, 1938. (508218.)

114. "Cathode-ray devices." British Thomson-Houston Co., Ltd., and D. Gabor. January 3rd, 1938. (Addition to 479064.) (508520.)

242. "Circuit arrangements for supplying operating current to cathode-ray tubes." British Thomson-Houston Co., Ltd., and D. S. Watson. January 4th, 1938. (508389.)

372. "Electric switches, switch-fuses, switch-sockets, and the like for use in alternating-current circuits." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and B. G. Harrison. January 6th, 1938. (Cognate application 35456/38.) (508221.)

373. "Electric switches, switch fuses, switch-sockets, and the like for use in alternating-current circuits." J. A. Crabtree and Co., Ltd., H. F. McLoughlin and B. G. Harrison. January 6th, 1938. (508390.)

549. "Electric transformers." English Electric Co., Ltd., G. F. Stearn and J. H. Hipwell. January 7th, 1938. (508109.)

699. "Electro-magnetically actuated electric switches." Midland Electric Manufacturing Co., Ltd., and A. W. Vicary. January 10th, 1938. (508110.)

1000. "Cathode-ray tube television transmitters." Marconi's Wireless Telegraph Co., Ltd. February 27th, 1937. (508391.)

1807. "Arrangements for converting direct current into alternating current." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 22nd, 1937. (508113.)

1833. "Electric wave meters." Marconi's Wireless Telegraph Co., Ltd. January 21st, 1937. (508392.)

3010. "Means for regulating two or more electrical qualities." Allmänna Svenska Elektriska Aktiebolaget and U. Lamm. January 31st, 1938. (508230.)

6058. "Electric transmission of power." Allgemeine Elektricitäts-Ges. February 25th, 1937. (508240.)

6828. "Means for signalling by flashes of light." General Electric Co., Ltd., V. J. Francis and E. R. Thomas. March 4th, 1938. (508241.)

7756. "Electric insulators." Micanite & Insulators Co., Ltd., London Passenger Transport Board, and G. E. Haefely. March 12th, 1938. (508244.)

8767. "High-pressure metal-vapour electric discharge lamps." General Electric Co., Ltd. (Patent Treuhand-Ges für Elektrische Glühlampen). March 22nd, 1938. (508412.)

9583. "Rotor construction for squirrel cage induction motors." Victoria Falls and Transvaal Power Co., Ltd., and E. F. Rendell. March 29th, 1938. (508414.)

9687. "Plug-and-socket couplings, combined switch and socket couplings, and similar electrical accessories." J. A. Crabtree and Co., Ltd., H. F. McLoughlin and B. G. Harrison. March 30th, 1938. (508415.)

9688. "Electric plug-and-socket couplings." J. A. Crabtree and Co., Ltd., H. F. McLoughlin and B. G. Harrison. March 30th, 1938. (508248.)

10294. "Distant electric control systems." E. Granat and Compagnie des Forges et Acieries de la Marine et d'Homecourt. May 4th, 1937. (508418.)

11285. "Electrical couplings of the plug-and-socket type." J. A. Crabtree and Co., Ltd., H. F. McLoughlin and B. G. Harrison. April 13th, 1938. (508419.)

14277. "Portable cable reel structure with electric fitting." C. I. Wilson. May 13th, 1938. (508253.)

15340. "Magnetic shunts for use in watthour meters or other electro-magnetic measuring instruments of the induction type." Westinghouse Electric and Mfng. Co. May 22nd, 1937. (508133.)

16555. "Induction furnaces." British Thomson-Houston Co., Ltd. June 2nd, 1937. (508255.)

17834. "Control systems for electrically-driven spinning machines." British Thomson-Houston Co., Ltd. June 16th, 1937. (508428.)

23837. "Attenuation equalisers for electric transmission and like systems." Standard Telephones and Cables, Ltd. September 22nd, 1937. (Addition to 469067.) (508341.)

27045. "Electric remote control installation employing direct current impulses." Landis and Gyr Akt.-Ges. October 8th, 1937. (508160.)

28010. "Timing circuits." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 29th, 1937. (508449.)

28662. "Electric heater for liquids." G. Fuchs and H. Spath. October 3rd, 1938. (508164.)

28683. "Electric gas blast switches." British Thomson-Houston Co., Ltd. October 2nd, 1937. (508165.)

28714. "Load regulating and limiting apparatus in electrical installations." P. Schiller. October 3rd, 1938. (508272.)

28990. "Prevention of cross-talk disturbances in electric cables operated with carrier frequencies." Felten and Guilleaume Carlswerke. October 29th, 1937. (508274.)

29829. "Lampholders." British Thomson-Houston Co., Ltd. October 16th, 1937. (508349.)

30017. "Electric cut-outs." British Thomson-Houston Co., Ltd. October 16th, 1937. (508169.)

30403. "Metal connecting caps for electrical circuit elements and methods of manufacturing the same." Elektrische Glühlampen Fabrieken. J. Kremenezky Akt.-Ges. October 21st, 1937. (508350.)

31237. "Electric cut-outs." British Thomson-Houston Co., Ltd. October 23th, 1937. (508175.)

31910. "Dry rectifiers." Patentverwertungs Ges. Hermes. November 3rd, 1937. (508177.)

32033. "Ultra-high-frequency electron discharge systems or dielectric guide transmission systems." Standard Telephones and Cables, Ltd. December 7th, 1937. (508354.)

32828. "Electric speed indicating systems." P. Kollsman. January 28th, 1937. (Cognate application 32829/38.) (Divided out of 36276/37, 508506 and 508507.) (508534.)

32854. "Dry rectifiers." British Thomson-Houston Co., Ltd. November 12th, 1937. (Addition to 497034.) (508180.)

36182. "Apparatus for rectifying alternating current." British Thomson-Houston Co., Ltd. December 11th, 1937. (508360.)

37995. "Ion discharge tubes for the rectification of high alternating voltage." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 3rd, 1938. (508190.)

1939

156. "Amplifiers comprising controlled electron-discharge tubes. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 6th, 1938. (508191.)

436. "Variable - gain amplifiers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. January 8th, 1938. (508462.)

4344. "Lecher line coupling arrangements for use on ultra-short waves." Telefunken Ges für Drahtlose Telegraphie. February 10th, 1938. (508297.)

10583. "Electrical switches of the snap-action type." J. A. Crabtree and Co., Ltd., H. F. McLoughlin and B. G. Harrison. December 31st, 1937. (Divided out of 508491.) (508537.)

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Australia.—MELBOURNE.—August 15th. Posts and Telegraph Department. Lead-covered, unarmoured trunk type cable. (T. 24602/39.)*

August 22nd. Automatic exchange trunk boards. (T. 24605/39.)*

September 12th. State Electricity Commission of Victoria. Two 35,000-kVA three-phase, outdoor-type transformers. (T. 25065/39.)*

September 27th. State Rivers and Water Supply Commission. One slip-ring induction motor. (T. 25131/1939.)*

August 22nd. Underground cables. (T. 24932/39.)*

BRISBANE.—November 2nd. City Electric Light Co., Ltd. 11,000-V and 415-V three-phase, metal-clad switchgear. (T. 24566/39.)*

September 5th. Electricity meters and current transformers. (T. 24836/39.)*

Billingham-on-Tees.—U.D.C. Electric wiring at houses in the Belasis Lane area.

Bootle.—August 12th. Borough Council. Colour-corrected mercury discharge lamps, lanterns, control equipment, time switches, tubular steel poles, brackets and cables. (See this issue.)

Burton-on-Trent.—August 29th. Electricity undertaking. Two turbo-alternators and four boilers. (July 21st.)

Croydon.—August 22nd. Electricity Department. Electric lighting and power installations at the new central offices and showrooms. (July 21st.)

Dundee.—August 16th. Electricity Department. High- and low-voltage, p.i., lead-covered cables. (See this issue.)

Egypt. — ALEXANDRIA. — August 21st. Ports and Lighthouses Administration. Two electrically driven pumping sets. (T.Y. 24916/39.)*

CAIRO.—August 16th. Ministry of Public Works. One 200-kW electric motor generator set complete with switchgear and all necessary equipment. (T. 24913/39.)*

Gravesend.—August 14th. Electricity Department. One 750-kVA transformer and e.h.v. switchgear. (See this issue.)

Harrogate.—October 1st. Electricity Department. P.i., lead-covered and armoured cables for twelve months. (July 21st.)

India.—SIMLA.—September 7th. Indian Stores Department. Electricity meters for twelve months. (T. 24782/39.)*

August 8th. Twenty-four sets of train lighting cells for the Eastern Bengal Railway. (T. 25066/1939.)*

Leeds.—Incorporated Association of Electric Power Companies. Electric domestic hair-dryers. (July 14th.)

London.—H.M. OFFICE OF WORKS.—August 10th. Electric lighting and power installations at British Museum (N.E. Quadrant). (See this issue.)

July 28th. Electric wiring installation at Glascoed R.O.F. (July 14th.)

SOUTHWARK. — August 21st. Borough Council. Electric lighting and power installations at new baths, Borough High Street. (See this issue.)

Manchester.—August 1st. Electricity Department. Six mercury-arc rectifier equipments and two emergency 50-kW Diesel-engine driven generators. (July 21st.)

August 10th. Three 40-000-kVA transformers at Stuart Street sub-station and transfer from Stuart Street to Greenwood Street sub-station of two 25,000-kVA transformers and provision of new oil coolers. (See this issue.)

Newport.—August 5th. Corporation. Electrical installation at the Gaer junior and infants' school. (July 21st.)

New Zealand.—CHRISTCHURCH.—September 11th. Municipal Electrical Department. Sixteen 200-kVA transformers. (T. 24886/39.)*

September 26th. One thirty-ton overhead travelling crane for Henderson sub-station. (T. 25128/1939.)*

Northern Ireland.—BELFAST.—August 4th. Electricity Department. One 10,000-kVA static transformer and an electrically driven centrifugal feed water pump. (See this issue.)

Portsmouth.—August 14th. Electricity Undertaking. High- and low-pressure steam and water pipework and valves. (July 14th.)

South Africa. — PRETORIA. — August 17th. Union Tender and Supplies Board. Telex switchboard system for Cape Town Central Telegraph Office. (T. 34477/39.)*

JOHANNESBURG. — August 9th. City Council. Six AC low-voltage metal-clad switchboards. (T. 24759/39.)*

September 9th. Isolating links. (T. 24760/39.)*

CAPE PROVINCE.—August 14th. Municipality of Swellendam. Oil engine and alternator, control panel and voltage regulators. (T. 24748/39.)*

Sunderland.—August 28th. Electricity Undertaking. P.i. cables, v.i.r. wire, meters and electric lamps for twelve months. (See this issue.)

Uruguay.—MONTEVIDEO.—August 15th. Electricity Supply and Telephones Administration. Electrical material, including fuse wire, lamp fittings, unions, cut-outs, switches, lampholders, &c. (T.Y. 24043/39.)*

August 24th. Single-phase, three-phase and single-tariff meters. T.Y. 24986/1939.)*

Wakefield.—July 31st. Electrical installation at Hebden Royd school. Education Officer, County Hall.

Orders Placed

Acton.—Education Committee. Electrical installations at schools (£998).—Theatrical Equipment Co.

Bedlington (NORTHUMBERLAND). — U.D.C. Accepted. Improvement of electric street lighting in the area.—F. Reid Ferens & Co.

Grimsby.—Town Hall Committee. Recommended. Internal telephones at municipal offices (£601). — Telephone Rentals, Ltd.

Cleansing Committee. Recommended. Vehicle battery (£154).—Chloride Electrical Storage Co. Two 50-cwt. electric vehicles (£801 each).—Electricars, Ltd.

Liverpool.—Electric Power and Lighting Committee. Recommended. Electrically-operated switchboard at the Garston sub-station (£12,947), less an allowance of £3,267 for the existing switchboard, and an electrically-operated switchboard at the Lark Lane sub-station (£13,676), less an allowance of £3,391 for the existing switchboard. — Met.-Vick. Electrical Co.

Recommended. Electrical plant in connection with the change-over from 6,000-V to 11,000-V: Twenty-four 1,250-kVA stepdown transformers (£10,632).—Electric Construction Co. Twenty-three 1,000-kVA step-down transformers (£8,625).—Bonar Long & Co. One 1,000-kVA step-up transformer (£350).—Met.-Vick. Electrical Co.

Recommended. 5,280-yd. of 33,000-V cable, joints and boxes in connection with the extension of the high-voltage mains from Lark Lane sub-station to Smithdown Road sub-station (£9,169, plus supervision charge of £12 per week).—B.I. Cables.

Recommended. Electrically-operated automatic soot-blowing equipment for boiler at Clarence Dock power station (£1,500) and fitting of two further boilers with similar equipment (£2,350 each).—Babcock & Wilcox.

Recommended. Modifications to the existing 21-panel switchboard at the Lavrock Bank sub-station to make it suitable for 11,000-V operation (£2,909).—Ferguson Pailin.

London.—ISLINGTON.—Electricity Committee. Recommended for twelve months. Electric kettles.—Premier Electric Heaters.

Metropolitan Water Board. Accepted. Electric motor for Campsbourne works (£214).—Bruce Peebles & Co.

Recommended. Two electric goods lifts at Hardwick Street testing station (£1,194).—Keighley Electrical Engineering Co.

L.C.C.—Wiring and fittings for electric lighting, power and fire alarm system at the Fountain Hospital, Tooting Graveney, S.W.17:—

	£
Buchanan and Curwen. Accepted ...	**3,285**
Read and Partners	3,508
Higgins and Cattle	3,573
Duncan Watson (Electrical Engineers) ...	3,591
Troughton and Young	3,797
W. J. Furse & Co. (London)	4,380
Samuel Reed & Sons	4,420
A. Meckhonik	4,599
H. J. Cash & Co.	4,930
Pinching and Walton	4,986
Electrical Installations	5,036
Holliday & Son (Electrical)	5,107
Bower Engineering Works...	5,400
Berkeley Electrical Engineering Co. ...	5,570

Installation of electric lighting, power, telephone and fire alarm systems at Hutton Residential School:—

	£
Read and Partners. Accepted[1]	**4,015**
Duncan Watson (Electrical Engineers) ...	4,103
Electrical Installations	4,120
H. J. Cash & Co.	4,129
Newman and Watson	4,650
Buchanan and Curwen	4,706
Archibald Meckhonik	4,779
City Electrical Co.	4,806
W. J. Furze & Co. (London)	4,950
Malcolm and Allan (London)	4,984
Bower Engineering Works (Electrical and General)	5,015
B. French	5,101
Blackburn, Starling & Co....	5,200
Alexander Hawkins & Sons	5,550
Pinching and Walton	6,012

Accepted. Wiring and fittings for electric lighting and power in three wards at St. Andrew's Hospital, Bow (£380).—Newman & Watson.

Manchester. — Education Committee. Accepted. Electricity alterations and

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from July 19th:—

Vocaphone. No. 606847. Class 9 (IV). Telephonic instruments and apparatus.—A. K. T. Bulkley, 4, New London Street, E.C.3.

Genitron. No. 607350. Class 9 (IV). Electrical apparatus and instruments.—Vacuum-Science Products, Ltd., 166, Weir Road, S.W.12.

Dictaphone (lettering and design). No. 604383. Class 9 (IV).—Sound recording and reproducing apparatus, etc. —Dictaphone Corporation, Bridgeport, Conn., U.S.A. (British representatives: Gee & Co., 51-52, Chancery Lane, W.C.2.).

Perihel, No. 606598, and Mountsun, No. 606599. Class 10 (IV). Electro-medical instruments.—Salomon Schaffer, 112, Ivor Court, N.W.1.

Mountsun. No. 606599. Class 10 (IV). Electro-medical instruments.—Salomon Schaffer, address as above.

Solflex. No. 605484. Class 17 (IV). Insulating materials.—Bell's Asbestos & Engineering, Ltd., Slough, Bucks.

additions at schools: Cavendish municipal.—F. H. Wheeler & Co. Grange Street special, Mulberry Street municipal, and Vine Street municipal.—S. H. Heywood, Ltd. Openshaw technical.—N. G. Bailey & Co. Styal Cottage Homes (two homes).—A. Loudon.

Electricity Committee. Accepted. 33,000-V sub-station switchgear.—Ferguson Pailin. 11,000-V cable.—Britannic Cable & Construction Co.

Warrington. — Transport Committee. Accepted. Electric tower wagon.—Morrison Electric.

West Lothian.—County Council. Sub-Committee. Recommended. Installation of electricity at schools.—James Kerr; Greig Bros.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Acton.—Factory extension off Chase Road; Chamberlain & Willows. Factory, Wales Farm Road; Wallis, Gilbert & Partners. Rebuilding the Isolation Hospital (£71,214); borough engineer.

Altrincham.—Lodging house in Balmoral Road for T.C. (£7,571); C. Musker & Bros., Ltd., contractors, Bingham Street, Swinton, Manchester.

Argyllshire.—Cinema, Argyll Street, Dunoon (£15,000); Robert Houston, architect, Kilbirnie, Ayrshire.

Ayr.—Houses (200), for T.C.; Scottish Special Housing Association, Ltd.

Ballina.—Clothing factory; Dr. Kronin & Sons, Dublin.

Barnet.—Council offices, Shenley Road (£14,624), for R.D.C.; surveyor.

Barnsley.—Extensions to St. Helens Hospital.

Bedlington.—Houses (80), on the Red House estate for the U.D.C.; G. Towers, builder, Union Street, Blyth.

Berkshire.—C.E. schools, Wargrave (£17,374) and Downs Area (£19,000); W. F. Herbert, secretary, Shire Hall, Reading.

Birmingham.—Maternity and child welfare centre, King's Road, Kingstanding, for T.C.; Herbert J. Manzoni, city surveyor, Council House.

Boreham Wood.—Factory on site adjoining Ripon Way for Yardley & Co., Carpenters Road, London, E.15.

Bournemouth.—Bungalows (15), Brockley Road; D. Barnes, Ltd. Senior school (£12,355) and infants' school (£9,473), Stourfield; A. S. Prince & Co. Senior school, Charminster (£26,234); J. A. Perriss.

Brickwood. — Congregational church, Oakwood Road; Milnes & Milnes, Barnet.

Brighton.—Nursery, Warren Farm institution (£8,037); borough engineer. Bungalows (75), Mount estate; Saltdean Estate Co.

Bristol.—Reconstruction of Globe Picture theatre, Lawrence Hill; A. French, architect, Halifax House, St. Augustine's Parade.

Chard.—Houses (70), in various parishes, for R.D.C.; D. R. Nicholls, council's architect, 21a, High Street.

Cheltenham.—Houses (59), Arle Road; Western Estates (Lawes Cherry), Ltd., Arle Road.

Cheshire.—Senior schools, Hazel Grove (£33,000), and Stockton Heath (£46,500), for E.C.; J. E. Bladon & Sons, 16, Albert Buildings, Preeson Row, Liverpool.

Coseley.—Factories, Parkfield estate; John Thompson Engineering Co.

Crewe.—Greyhound track at Crewe Alexandra Football Ground (£20,000); W. Aland, Vance Road, Blackpool.

Crickhowell.—Houses (34), for the R.D.C.; J. Vaughan Richards, architect, Council Office.

Croydon.—Dwellings (154), Long Lane; borough engineer.

Darlington.—New premises in Crosby Street for Darlington Co-op. Society.

Doncaster.—Houses (58), on site in Sandringham and Armthorpe Roads; A. Thomson, builder, 9, Imperial Crescent. Parish church of St. Peter in Warmsworth Road; P. P. Taylor (Doncaster), contractors, South Parade.

Dublin.—Houses (27), Wilfield Road, Ballsbridge; Modern Homes, Ltd.

Edinburgh. — Cinema, Queensferry Road, Craigleith Station; Associated Cinema Properties, Ltd.

Egremont (CUMBERLAND). — Houses (68), for the North-Eastern Housing Association; R. Brown, architect, Council Buildings, Cleator.

Folkestone.—Houses (26), Warren Way; G. Stone.

Golborne.—Lowton Council school for Lancashire E.C. (£36,396); George Moss & Sons, Ltd., contractors, Back St. Helens Road, Leigh, Lancs.

Gosforth (NORTHUMBERLAND). — Flats on the Grange Park estate; Cussins, Ltd., builders, Kenton Road.

Grangemouth. — Cinema in Lumley Street (£15,000), for Grangemouth Picture House, Ltd.; The Secretary, 38, Bath Street, Glasgow.

Grimsby.—School, Carr Lane; Education Committee.

Guisborough.—Houses (22), for the U.D.C.; F. A. Russell, surveyor, Council Offices.

Hendon.—Houses (36), Salcombe Gardens, Mill Hill; A. Graham. Extensions to factory, West Hendon; Eugene, Ltd.

Hinckley (LEICS). — Modern dairy buildings at Castle Hill, for the Co-operative Society; C.W.S. Architects Dept., 1, Balloon Street, Manchester.

Hull.—Store premises, Whitefriargate (£100,000), for Littlewoods, Ltd., Sefton Street, Liverpool.

Jarrow-on-Tyne.—Maternity and child welfare clinic for the T.C. (£7,250); borough engineer.

Keighley.—New hospital at Morton for West Riding County Council. New art school (£30,000), for West Riding C.C.; county architect, Wakefield.

Kidderminster.—Houses (51), Cairndhu estate; Taylor & Taylor, architects, Edgbaston Road, Smethwick, Birmingham.

Leek (STAFFS).—Reconstruction of silk works, Leekbrook, for Joshua Wardle, Ltd.; W. C. Skinner, contractor, 316, Birchfields Road, Birmingham, 20.

Liverpool. — Houses (40), Thingwall Road, Westway and Wavertree Nook Road, for District Estates, Ltd.; A. E. Shennan, architect, 17, North John Street. Flats (48), Broadgreen Road, Oakhill Park, for A. J. Wannop, Gorsey Lane, Wallasey. Houses (48), Kirkmaiden Lane, Glenhead Road and South Mossley Hill Road, Heathside Estates, Ltd.; A. E. Shennan, architect, 17, North John Street.

London (BATTERSEA).—Nursery school, Wycliffe site (£6,740); L.C.C. architect. (HAMMERSMITH).—Enlargement of Central school (£15,785); L.C.C. architect. (ISLINGTON).—Houses (218), Canonbury estate; borough engineer. (PADDINGTON).—School, Monmouth Road (£19,260); L.C.C. architect. (SOUTHGATE).—Flats (24), Westpole Avenue; J. H. Scar borough. (WHITECHAPEL). — Nursery school, Cannon Road (£6,850); L.C.C. architect.

Longbenton.—Houses (106), Dudley Lane (£37,000); U.D.C. surveyor. Houses (172), for Longbenton Urban Council (£57,950); T. Rigby, contractor, North Shields, Northumberland.

Macclesfield.—Extensions to West Park Hospital; F. Anstead Browne, county architect, The Castle, Chester.

Manadon.—Royal Naval Engineering College at Manadon Wood (£500,000).

Manchester.—Cinema, Ashton Road, Denton, for the Marcliff Cinemas, Ltd.; C. Ogle, contractor, Woodbank Park Estate Office, Offerton, Stockport.

Middlesbrough.—Additions to factory, Smeaton Street, for Rundle & Co.; H. C. Garbutt, architect, 18, Albert Road.

Newcastle-on-Tyne.—Extensions to the Royal Victoria Infirmary for the Governors (£18,000); T. Clements & Son, builders, Selborne Gardens, Jesmond. New Rutherford secondary school for the City Council (£185,300); A. Anderson (Contractors), Ltd., Stanmore Road. New garage in Stowell Street; Hadden & Hillman, contractors, 127, New Bridge Street, Newcastle.

Northumberland.—New school for the C.C. at Shankhouse; W. W. Tasker, county architect, County Hall, Newcastle-on-Tyne.

Nuneaton.—Houses (40), Ansley Common, for Ansley Hall Coal & Iron Co.; W. Fidler, architect, Ansley.

Ongar. — Enlargement of residential school (£18,910); L.C.C. architect.

Plymouth.—Houses (56), and 12 flats, Bridewell Road, &c.; Taylor Woodrow Estates, Ltd.

Renfrewshire. — Church halls and offices at Giffnock for Church of Scotland; The Secretary of the Trustees, 121, George Street, Edinburgh.

Roscrea.—New sanatorium for North Tipperary Board of Health (£60,000).

Rosyth.—Houses (135), Kings Road; Scottish National Housing Co.

Rowley Regis.—Houses (46); A. & J. Mucklow, Ltd., Tividale Road.

Rugeley. — Houses (261), Crabtree estate, Etchinghill; C. F. Byng, architect, The Vale, Armitage Road.

Salford.—Senior school, Hope Street; J. C. Prestwich & Son, architects, Leigh. Extensions (£28,000), Hope Hospital and Ladywell Sanatorium; borough surveyor.

Sheffield.—Senior school at Beaver Hill Road, Woodhouse; W. G. Davies, city architect, Town Hall. Church of St. Patrick, Barnsley Road, for the Rev. B. J. Ford, P.P.; M. G. Gleeson, contractors, 822, Chesterfield Road, Woodseats.

Sleaford.—Houses (51), Lincoln Road housing scheme, for U.D.C.; S. F. Clare, surveyor, 19, Jermyn Street.

Smethwick.—Shop, showroom, &c., at Cape Hill, for Montague Burton, Ltd., Hudson Road Woollen Mills, Leeds, 9; C. L. Smith, contractor, Oughton Place, Camp Hill, Birmingham, 12.

South Shields.—School, Harton Lane; R.C. authorities. Houses (14), Sunny Rise; G. R. Smith & Partners. Bus station, Mile End Road (£6,062); borough engineer. Chemical factory, West Holborn; Tyne Chemical Co.

Southport.—Senior school, Preston New Road; Leathart & Granger, architects, 9, Savile Row, London, W.1.

Stanley (Co. DURHAM).—Houses (28), for Urban Council; A. Routledge, surveyor, Council Offices.

Stockport.—New school for parishes of St. Mary's, Heaton Moor, and St. Joseph's Reddish, Denby Road, Heaton Norris (£22,600); T. J. Cahill, architect, 14, Princess Street, Manchester.

Stockton-on-Tees.—Houses (70), Hartburn Lane, for H. Cohen; G. P. Stainsby, architect, 25, High Street.

Sunderland. — Juvenile instruction centre in St. George's Square and new school on the Plains Farm estate, for E.C.; O. H. Mark, architect, 4, Tatham Street. Rebuilding Theatre Royal (£25,000), for Blacks Theatre, Ltd.

Surbiton.—Houses (44), and 20 flats, Clayton Road (£23,495); borough engineer.

Swansea.—Enlargement of Technical College (£59,937); Griffith Davies & Co.

Swinton and Pendlebury.—Houses (36), off Folley Lane (£7,088); A. Cordwell, borough surveyor, Town Hall.

Tynemouth.—New senior school at Cullercoats for the E.C. (£50,000); Stephen Fenwick & Co., builders, 46, Dunn Street, Newcastle-on-Tyne.

Warlingham. — Houses (384), Mountview estate; Pearson & Co., architects, 189, Stanstead Road, S.E.23.

Warrington.—Cinema, Beresford Street; R. & S. Smith. School, Brook Avenue; R.C. authorities.

Wembley.—Houses (78), Barn Hill estate; Wimpey & Co., Ltd., The Grove, Hammersmith, W.6.

Whitley Bay.—Houses in Drumoyne Gardens, for C. Howey, builder, 86, Monkseaton Drive.

Woking.—Enlargement, Mayford school (£24,600); L.C.C. architect.

Woolwich. — School, Middle Park (£33,365); Oliver Hill, architect.

Worsley.—Houses (110), Engine Fold, Hilton Lane, Virgins Inn, and Mountain Street, for U.D.C.; H. Lomax, clerk, Town Hall, Walkden. Houses (48), at Little Hulton; surveyor, Town Hall, Walkden.